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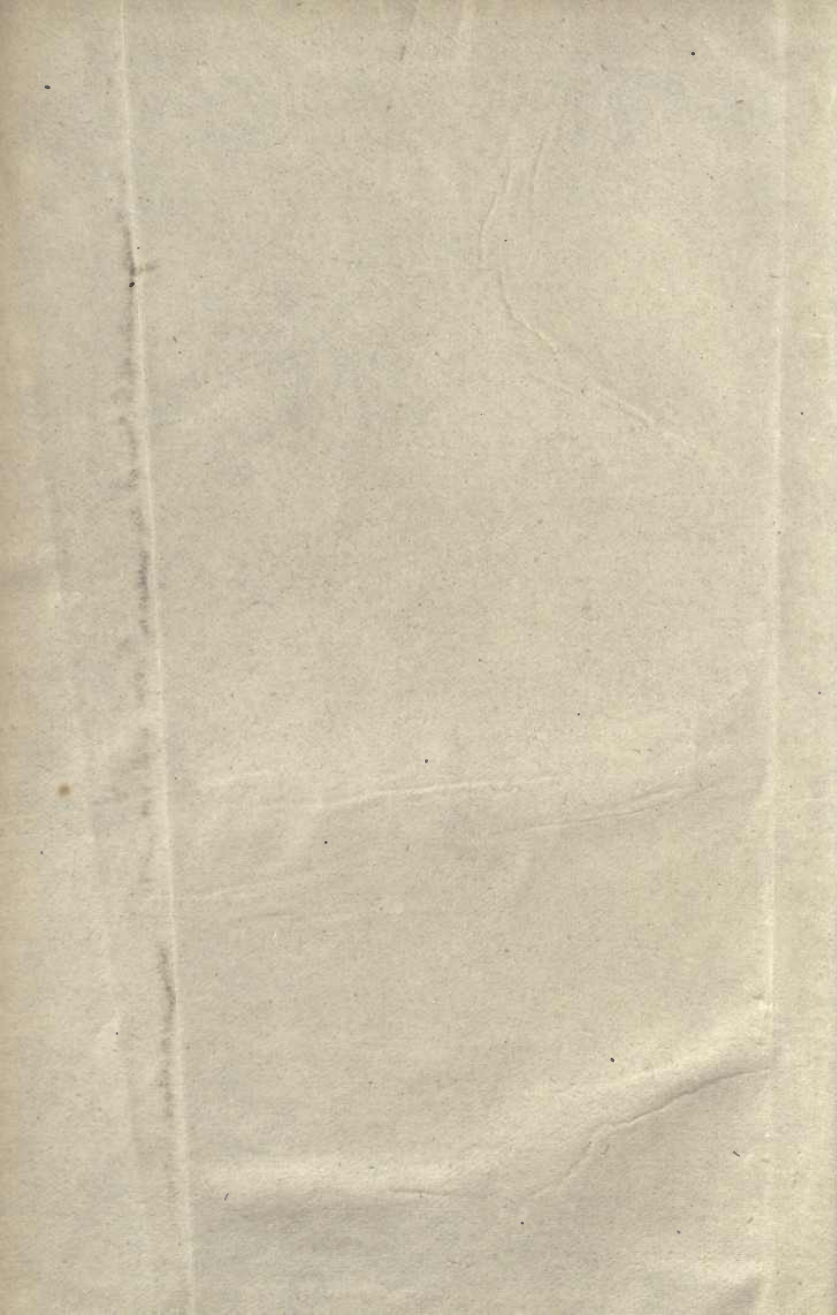
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BOOK OF EVEREETS

THE

CONFERENCE

OF CONFERRING LEADERS

JOHN HOPKINS

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THE
BOOK OF EVERGREENS.

A PRACTICAL TREATISE ON THE
CONIFERÆ,
OR CONE-BEARING PLANTS.

BY
JOSIAH HOOPES,
MEMBER OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

ILLUSTRATED.

NEW YORK:
ORANGE JUDD & COMPANY,
245 BROADWAY.

S B435
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TO THE MEMORY OF

Dr. WM. DARLINGTON,

AS A SLIGHT TRIBUTE OF RESPECT AND ADMIRATION

FOR HIS MANY VIRTUES,

DISPLAYED THROUGHOUT A LONG AND USEFUL LIFE.

P R E F A C E .



If a life devoted to the study of trees and plants be a sufficient excuse for an unknown author to intrude his views and experiences upon the public, then the writer of this volume feels at liberty to present his first offering.

His principal inducement for undertaking a work of this kind was the want he had himself experienced at the commencement of his own studies. Having for years awaited the appearance of a publication suited to the climate of this country, he at last concluded to compile the results of his own observation and practice.

There has not heretofore been an American work on Conifers, giving descriptions of all the different species and varieties that will endure the climate of the Middle States; and without wishing to detract from the merits of the few excellent works that treat upon this subject to a limited extent, he believes that the present volume will fill up a blank in our works on horticulture, that has heretofore been much felt. In its compilation he has collected much valuable information from the most approved writers on the subject, and added his own experience and observation in a plain and impartial manner, with a view to aid his countrymen in making a selection of the most suitable Conifers for their respective situations.

The differences of European and American authorities, with respect to nomenclature, are numerous and perplexing, and where there were dissimilar opinions, the author has studied the characteristics of the doubtful plants, and placed them under what he considered their

proper titles, without regard to nationalities or prejudices. The author acknowledges his indebtedness to the excellent works of Gray, Chapman, Darlington, Endlicher, Richard, Loudon, Gordon, Lawson, Murray, Nuttall, Michaux, and others, from which a portion of the descriptions have been drawn.

To the following friends, who have aided him in his "*labor of love*," he would return his sincere thanks, whilst gratefully remembering the many acts of kindness received from others, who are not particularized in this place.

To Thomas Meehan, editor of the "*Gardener's Monthly*," for his constant aid from the commencement of the work, and especially for valuable information in regard to the newer species.

To his esteemed correspondent, Dr. C. C. Parry, of Davenport, Iowa, for many interesting notes furnished on our Rocky Mountain Coniferæ.

To Professors S. S. Rathvon, and J. Stauffer, of Lancaster, Pa., for valuable notes on insects injurious to this family of trees.

To Prof. George Thurber, of New York City, for his careful supervision of the whole work, and by whose practical knowledge its value has been greatly enhanced.

To the late John Evans, of Radnor, Pa., for many excellent ideas, as well as for numerous specimens contributed, the result of a long life of study and travel.

To the late Dr. Wm. Darlington and Joshua Hoopes, of West Chester, Pa., for unvarying kindness, unsolicited assistance, and the advice and instruction which enabled him to become acquainted with this important subject.

Should this first attempt be rewarded by the encouragement of the reader, and a renewed interest awakened even in a few, the author will feel that the time devoted to its compilation has been well spent.

JOSIAH HOOPES.

Cherry Hill Nurseries, West Chester, Pa.

CHAPTER I.

INTRODUCTORY.

- In writing a work upon a particular family of plants, the author is at loss to know how far he can presume upon the knowledge of the reader with respect to plants in general. Believing that there are many who would consult this work to learn some points about *Coniferæ*, or Cone-bearing plants, who are not familiar with plant structure and the systems of classification, the writer has preferred to be elementary and explain many terms that, to the botanical student, would need no definition. No one who has not attempted to write a work that shall be equally useful to the experienced man and the novice, is aware of the difficulties attending the task. We are obliged to assume that the reader is aware—or if not advised, we have to state—that all plants are divided into two great series, the Flowerless and the Flowering Plants. The former are called *Cryptogamous*, meaning plants with hidden fructification; and the latter *Phænogamous*, or those in which the parts concerned in fructification are readily observable. Flowering (*Phænogamous*) plants, those with which we are most familiar, are subdivided into two classes: *Dicotyledonous* plants, having two seed-leaves to the young plant, or embryo, and their stems showing a distinct pith, wood and bark; and the *Monocotyledonous* plants, that have but one seed-leaf to the embryo and no distinct wood, pith, and bark in the stem. Besides this,

monocotyledonous plants have usually leaves with parallel veins, while those of the other class have the veins of the leaves more or less interwoven or netted. The stems of the woody dicotyledonous plants show a regular annual growth; each year a layer of wood is deposited outside of the older growth, and they are called *Exogens*, or outside growers, while, as this order of growth is not observed in the monocotyledonous plants, and the newer woody fibres are mostly in the centre of the stem, they are called *Endogens*, or inside growers. To the first of these classes, the *Exogens*, or Dicotyledons, belongs the *Coniferæ*, or Pine Family, which presents peculiarities of structure differing from other *Exogens*, and which will be described further along.

To the Cryptogamous or flowerless plants belong the Mosses, Ferns, Club-mosses, and others still more simple in their structure.

Geological researches have shown that after the formation of this lower order of vegetation, the *Coniferæ* came into being. This period was coeval with the formation of stone coal, which is indicated by the distinct and beautiful impressions found in the various strata throughout the coal regions.

In the three great periods or epochs of geological history, we find by the vegetable remains that, during the first period, their flora consisted principally of the cryptogamiæ, or flowerless plants, with a few dicotyledonous plants. These two classes were about equally divided in the second period; and in the third, the dicotyledonous plants constituted much the larger portion, whilst the cryptogamia were rare.

Monocotyledonous plants existed in every period, although by no means plentiful in any of them.

In the first period the prevailing families were Ferns and enormous Equisetums, or Horse-tails; in the second epoch, only one-third were Ferns, and the remaining two-thirds

Coniferæ and Lycopodiaceæ, or Club-mosses, with intermediate allied forms. The third period presented much the same disposition of vegetation as the present existing forms.

Dr. Buckland, in his Bridgewater Treatise on Geology, says: "The family which has most universally pervaded every stage of vegetation is that of Coniferæ, increasing in the number and variety of its genera and species at each successive change in the climate and condition of the surface of the earth. This family forms about one three-hundreth part of the total number of existing vegetables."

The ancient writers frequently mention the existence of the Coniferæ, and used the Pines and Cedars as striking illustrations of strength and durability. The Romans used garlands of pine branches for crowning the victors in their games, and the wood to form their funeral piles. The cones and seeds were considered medicinal, and were sought after for flavoring their wines. The rare gracefulness and artistic arrangement of many of the species were used as models by the sculptor, and the timber was employed for building purposes. According to Theophrastus, an early Greek writer, the wood of the pine was so saturated with resin that it formed excellent torches, which were used at the sacred ceremonies.

The assertion of Pliny that the wood of the Larch never creates a flame when burning, as well as that it never flowers, is an error that leads us of the present day to question whether he ever saw the tree. The same author speaks of the preservative properties of the juice of the Cedar, and states it was used in preparing mummies. The Cedar of Lebanon was considered by the profane writers as symbolical of durability, but it is very probable that other Conifers were known under this name.

The wood of the Cypress was also held in great respect by the ancients, and the branches employed in religious

exercises. Its balsamic properties were considered medicinal, even to the odor exhaled from the trees. The timber was used extensively in both naval and civil architecture; and in ornamental plantations, particularly for cemetery purposes, the Cypress was regarded as the most eligible plant known.

The Juniper was also known to the early writers, being noticed by Pliny and Virgil; and whilst they generally admit the medicinal virtues of the fruit, its shade was considered by them as highly injurious to animal life. The Yews are, perhaps, more frequently mentioned by the ancient writers than any other genus of the *Coniferæ*, allusions being made to them in the writings of Cæsar, Pliny, Suetonius, Nicander, Plutarch, Galin, etc. Their poisonous properties appear to have been greatly overrated, for Gerard, the quaint old writer, in his day exposed the fallacy of most of these statements.

The exceeding toughness of the wood of the Yew, however, was known and appreciated, for it was used extensively for manufacturing bows. The custom of planting the Yew around the graves of the departed was universal with the ancients, and has continued popular until the present day.

In many places throughout the sacred writings we find the *Conifers* beautifully mentioned, the similes often being among the most eloquent passages known in the English language.

The Cedars are much more frequently quoted than any other genus, and are particularly described as being exceedingly durable and strong; thus endorsing the statements of the profane writers, but in which we, of the present day, cannot acquiesce. So highly was the Cedar tree held in the estimation of the inspired writers that the attributes of strength, height, size, growth, and fruitfulness were constantly made comparable to this tree. The Fir was seldom mentioned, and the Pine was alluded to

even less frequently. In the First Book of Kings it is stated that Elijah "lay and slept under a Juniper tree in the wilderness." This tree is also incidentally mentioned in the Books of Job and Psalms, but we believe, with these exceptions, in no other instance throughout the Scriptures. The Yew is not alluded to by any of the sacred writers.

According to Loudon, "the first author who wrote exclusively on trees and shrubs appears to have been Belon, a Doctor of Medicine of the faculty of Paris, who produced a small quarto volume, entitled: *De Arboribus, Coniferis, Resiniferis*, etc., printed in Paris in 1523, and illustrated with a number of engravings on wood. Different species of *Juniperus* and *Cupressus*, the *Thuja Orientalis*, *Cedrus Libani*, and several pines and firs, as well as the Larch, are described and figured; and a number of other plants are mentioned incidentally." Since Belon's time, however, the French have paid the Coniferæ marked attention; more, perhaps, than any other nation.

Loudon also says: "In Delamarre's *Traite Pratique de la Culture des Pins*, 3rd Edition, published in 1834, will be found an alphabetical catalogue of forty-three authors, who have written more or less on the culture of the Pine in France."

Among the many writers on Coniferæ, the same authority states that Tournefort was the first to study them scientifically, and to class the order into genera, as described in his *Institutiones*, published in 1717 and 1719. He was followed by Linnæus in his *Genera Plantarum*, published 1737; by Adanson, in his *Familles des Plantes*, published 1763; and by Jussieu, in 1789, in his *Genera Plantarum*. These writers were succeeded by Solander, in 1786; by Gærtner, in 1791; by Lambert, in his first volume entitled *Monograph of the Genus Pinus*, published in 1803; which was followed by his second volume in 1832, and the third in 1837. Other botanical authors have, during the

present century, devoted much labor to the investigation and proper classification of this important order. Prominently, we may mention the names of L'Heritier, Smith, Link, Persoon, Barrelier, Salisbury, Ventenat, Desfontaines, Tazzetti, Schubert, Richard, Mirbel, Tristan, Lamarek, R. Brown, Michaux, Rafinesque, Don, Lindley, Loudon, Douglas, Menzies, Endlicher, Siebold, Hooker, Knight, Nuttall, and others, with the more recent authors, Carriere, Gordon, Veitch, Murray, Engelmann, Gray, Parry, etc.

The great natural order Coniferæ very appropriately derives its name from its peculiar mode of fructification, which signifies, literally, a Cone-bearing tree; and, as a considerable number of distinct characteristics mark its every stage of growth from the embryo to the mature tree or shrub, it should claim, in no small degree, our patient investigation and research.

Having commenced, therefore, with the first evidences of its formation, we will follow its history through the changes that mark its growth.

The Coniferæ is the only well-known order belonging to the sub-class *Gymnospermæa*; i. e. naked-seeded. Their peculiar, yet simple, mode of fructification is exceedingly interesting to the botanist, and furnishes the most reliable and distinctive characters by which the different genera and species are distinguished. The several members of this important family are all trees and shrubs, abounding throughout their entire structure with resinous juice. Examined by the microscope, the walls of their wood-cells are marked by curious circular disks and glands, but the wood is entirely destitute of ducts. The leaves are linear or lanceolate, diverging into needle-shaped, awl-shaped, or scale-shaped, with all their intermediate and combined forms; excepting in the *Salisburia*, which has a very curious fan-shaped or wedge-shaped leaf, on a long petiole. The *Larix*, (*Pseudolarix*?), *Taxodium*, *Glyptostrobus*,

and *Salisburia*, produce deciduous leaves, and the remainder of the family are all evergreen, or have persistent foliage.

The chief peculiarity of this order is in the naked ovules or rudiments of seeds, which are borne mostly on the inner surface of a scale or carpellary leaf, and fructified by the immediate application of the pollen, without the service of a pistil or the appendages of calyx and corolla. The flowers are borne principally in aments or clusters, and are either in the axils of the leaves, as in the Junipers and Yews, or at the extremities of the branches, as in the Pines and Cypresses. In the pistillate aments each individual carpellary scale acts as a separate and distinct flower, and the whole combination, when mature, forms a species of multiple fruit, or, as it is generally designated, a cone. The sterile flowers are also in aments, and usually consist of a small collection of stamens, adhering to the under side of a scale.

In fruiting, this order displays a great diversity of forms and characters. In the sub-order Abietinæ and most of the Cupressinæ the species are recognized by the woody cones of different sizes and shapes, whilst in the *Juniperus* and *Taxaceæ* the fruits in their primitive condition are small cones and furnished with carpellary leaves, but swelling at maturity into drupe-like berries, or fleshy, naked drupes. The albumen of the seeds is of an oily, fleshy consistency, with the embryo in the axis. The cotyledons in this family range from two to many in a whorl.

The near affinity displayed between many genera, as in *Larix* and *Cedrus*, *Abies* and *Picea*, *Cupressus* and *Chamæcyparis* (?), *Taxodium* and *Glyptostrobus*, etc., has caused much controversy and apparent diversity of sentiment in many of the authorities before quoted; and even to this day no established rule can possibly be given to settle these disputed points. In the sub-orders, any one, by careful study, can ascertain the leading characteristics that bind together the different genera composing them,

and thus be enabled to trace any particular tree or plant to a description in this work.

The order is subdivided into three sub-orders, or sub-families, which are, by some botanists, given the rank of orders.

The sub-order *Abietinæ*, or Pine sub-family, are all large sized trees, growing mostly in a conical form, and having large, spreading, roots, and horizontal branches with drooping branchlets. The members of this group all have evergreen or persistent leaves, excepting the Larch, (*Larix*), with both sterile and fertile catkins, usually on the same tree but on different branches. The cones, or strobiles, which form the main point in distinguishing the sub-orders, are in this very much alike in structure, although differing greatly in size and shape. Seeds, mostly edible, resinous and oily, the embryo with from 2 to 12 cotyledons. Buds, scaly.

The sub-order, *Cupressinæ*, has, with few exceptions, smaller sized trees or shrubs. They are all evergreen except the *Taxodiums* and *Glyptostrobus*, with generally a conical form, which, in many instances, approaches the fastigiata. The cones of this group are smaller than those in the foregoing, and are composed of dry scales, excepting in the *Junipers*, which are drupe-like berries at maturity. Buds, naked.

The Third sub-order, *Taxineæ*, or Yew sub-family, is very distinct from the others, and is by many botanists separated from the *Coniferæ*. The species belonging to this are about equally divided between the medium-sized and smaller class of trees, and produce in fruit a naked drupe, or, in some instances, a fleshy, drupe-like berry. Buds, scaly.

No known order of plants presents such a diversity of size as that of the *Coniferæ*. From the humble, trailing shrub, it embraces trees of every size to the lordly *Sequoia gigantea* of 300 feet in height. Every shade and tint of

green is also beautifully displayed in the foliage of the various species, and in the many curious and unique varieties we have the variegated leaves that occasionally occur throughout the whole of our flora.

The extensive fir and pine forests of Northern Europe that clothe the mountain ranges so universal in those countries, cover millions of acres, and contain some magnificent specimens in size and beauty. But large as these enormous tracts appear, they are inferior to those of our Western regions. Immense tracts of timber clothe the summits and sides of a large portion of the Rocky Mountains, and the section of country west to the Pacific Coast. Some of the enormous trees found in these localities are of almost incredible size. Specimens of the *Pinus Lambertiana*, *Picea nobilis*, *Picea grandis*, and *Sequoia gigantea*, are often met with reaching a height of 200 feet and upwards.

The several genera composing this order are limited to no particular climate or country, but are natives of the torrid, frigid, and temperate zones, throughout the whole world. Each region has its own representative, marked by its peculiar type of growth. On the coldest summits of the Alpine peaks of Lapland, at the very utmost limits of arborescent vegetation, are found many of the dwarfer species; whilst, on the other extreme, the splendid *Araucarias* and *Dacridiums* develop their beauty beneath the scorching sun of a torrid clime.

Although the family is not remarkable for producing edible fruit, and only a few members of it that of sufficient value for exportation, yet many of the species bear very nutritious seed, upon which the natives of those countries where they grow, almost entirely subsist.

The *Pinus Lambertiana*, for instance, has large, dark-brown seeds, that are eagerly gathered by the Indians, and form one of their principal articles of food. The *P. pinea* also produces large, nut-like seeds, about three-quar-

ters of an inch in length, which are considered quite nutritious, and are even in limited demand as an article of commerce.

For their medicinal and mechanical properties, the products of this family constitute a very important item of traffic. Various so-called balsams and resins, that are serviceable in the materia-medica, as well as the pitch, tar, rosin, and turpentine of trade, have yielded an immense annual income to the manufacturers. For building purposes, both in naval and civil architecture, the lumber furnished by the *Abietinæ* is, perhaps, the most useful and valuable in the market. The immense rafts of White and Yellow Pine, as well as Hemlock Spruce, that are conveyed yearly to our large cities, contribute largely to their mercantile prosperity, and produce a livelihood for large numbers of workmen in those sections from whence it is obtained.

CHAPTER II.

SOIL AND PLANTING.

We desire in this chapter to point out many of the evil practices into which planters, in this country, too frequently fall; as well as to give a few concise instructions in regard to the proper time and manner of transplanting, selection and preparation of soils, etc. These rules are the fundamental principles upon which everything else depends; for, if correct ideas are wanting at the commencement, failure will inevitably be the result.

In planting evergreens on a lawn, care must be observed to ascertain whether the soil is suitable for their healthy growth and subsequent development. With a very few exceptions, the *Coniferae* prefer a light, sandy subsoil, open and porous, that will admit of a perfect drainage, yet with a deep, rich surface soil, to afford a proper supply of healthy nourishment to sustain the large quantity of fibres with which their roots are furnished.

We have closely observed for a number of years that on stiff, clayey soils, or those which are retentive of moisture, the half-hardy species will inevitably be killed, or what is more annoying, be severely injured. Experiments in various parts of the country, in regard to this particular, have always decided that much more depends upon the quality of the soil, than on the temperature of the atmosphere. The reason of this is obvious; for, in almost every instance where an unacclimated tree has been injured, we

find that the plant has either been prevented from forming its growth early in the season, and, in consequence, has been overtaken by the frosts, or, as is very often the case, it has grown over-luxuriantly, and the nature of the soil has prevented it from properly ripening the young wood.

An excellent example of the value attached to light soils is shown by a Deodar Cedar that is standing on our own grounds.

This beautiful species has been pronounced tender by almost all planters, and its dissemination consequently discouraged. The specimen to which we allude is, at the present time, about 25 or 30 feet in height, and quite broad in proportion; and so perfectly is it adapted to the situation, and, to all present appearances, entirely acclimated, that it passes through each winter without the least protection; and by all owners of heavy soils is regarded with undisguised astonishment.

It is growing in a somewhat warm exposure, and in almost pure sand, with a good, mellow surface. Thus, whilst the tree is debarred from making a rank growth, the wood ripens sound and healthy, and the very end buds remain until spring sound and full of vitality.*

The magnificent specimen of *Abies Douglasii*, referred to in the description of that species, and at the present time growing in the Evans Arboretum, is another excellent example of the influence of soil on the growth of half-hardy plants.

Trees that are natives of low, swampy grounds will also, in many cases, thrive satisfactorily in dry situations. Near the Deodar above mentioned, is growing a fine, healthy, deciduous Cypress, (*Taxodium distichum*,) that inhabits the low miasmatic swamps of the Southern States; and yet, on this apparently dry ground, it flourishes with all the vigor that the wild trees do in their marshy soil.

* This tree has, since the above was written, been killed by unprecedentedly severe weather.

We do not wish to be understood as recommending a poor, thin soil, but we prefer a good mellow surface that is not too rich, especially in organic manures, and that would produce fair crops of grain; on such the great majority of evergreens will develop that peculiar rich green foliage which causes the family to be so universally admired.

In all cases where the soil is not naturally in the above condition, the drain-tile should invariably be used, as stagnant water, when allowed to remain in the vicinity of roots, is sure to cause decomposition. In such cases, when a tree is lifted, long, bare roots that are almost entirely destitute of fibres, are found in the place of a mass of small rootlets, ramifying in every direction.

Another important consideration, and one that we presume our cultivators have entirely overlooked, is the fact that different formations of soil tend to produce contrary effects in many species of the Coniferæ; and the same species that flourishes in a limestone soil, will not unfrequently languish on a talc-slate, or red shale. As regards this indiscriminate planting without a proper observance of the especial constitutional requirements of each tree, we desire to call the attention of our readers to the following remarks of the Earl of Ducie, which originally appeared in the Transactions of the Scottish Arboricultural Society, a few years since:

“As a general and sufficiently obvious rule, the Coniferæ thrive in proportion to the depth of the surface soil on which they stand. This is especially the case with the *Deodar* and *Pinus insignis*. The rule does not, however, appear to apply invariably to *Abies Douglasii*, as I possess specimens growing as vigorously on the cold and sterile shales of the carboniferous limestone, as others on the deep and warm soil of the old red sandstone.

“The most fastidious of the Coniferæ which I have had an opportunity of observing, is, undoubtedly, *Cryptome-*

ria Japonica. On the limestone, its leading shoot is always defective, and its growth generally devoted to the formation of a nest-like mass of small roots; whilst, on the old red, a formation deficient in lime, its growth is regular, upright, and graceful, and so rapid that I have no hesitation in affirming that, in this locality, it would outgrow the Larch.

“The Deodar, on the other hand, appears to be the least discriminating and the most accommodating of all the Coniferæ. No position, and no variety of soil, appear to come amiss to it; on lime or sandstone, rock or clay, it grows with equal facility, though depth of soil, as before stated, invariably contributes to rapid growth.

“In *Araucaria imbricata*, though planted in considerable abundance, and in every variety of soil, I have not been able to detect any decided preference for one formation over another. It has an evident dislike to a wet locality, and it generally, though not exclusively, thrives best upon a dry soil.”

A number of other instances are given, but as they are of species which we are debarred from cultivating on account of climate, we have not quoted them. We are unaware of any observations having been made in our country in regard to this important subject, but as every incident connected with the proper acclimating of trees is of incalculable benefit to planters, we earnestly desire a careful investigation of this subject, believing it will eventually lead to discoveries which will very materially enlarge our list of available Conifers.

In planting, a sufficiently large hole should be excavated to allow full scope for the roots to start vigorously into action. A very deep hole is unnecessary, as those roots that principally maintain the health and vigor of the tree extend near the surface of the ground; and the large roots that penetrate downward for a great distance are for the purpose of sustaining the tree erect, and prevent-

ing the action of storms from disturbing its equilibrium. This latter class of roots is seldom of large size in nursery-grown trees, owing to their having been frequently removed; but in a young seedling taken from the forest, it is almost always the only kind that are found. These tap-roots are considered by most writers on the subject to be of only secondary importance in affording nourishment to the tree, the rootlets and small fibres thrown out just under the surface of the ground performing that service.

When transplanted, young forest trees very frequently die from the want of a sufficient number of these surface or fibrous roots; but, were it not for the long and powerful tap-roots when the tree arrived at maturity, and, as is often the case, presenting a tall, branchless body, the tree would inevitably be destroyed by heavy winds.

Every intelligent writer for years has "kept it before the public" that a tree should never be planted deep, and in fact, shallow planting is absolutely necessary to insure a healthy growth. In setting out a tree, allowance should always be made for the settling of the recently moved earth, so that when the soil returns to its usual compactness, the tree shall stand the same height as it did previously to being disturbed.

This is, perhaps, the most important part of the whole operation, and upon a close observance of this fact depends the future prosperity of the tree.

In planting evergreens, many ignorant persons use fresh stable manure, placing it directly in contact with the roots. This will assuredly cause decomposition to take place, and the death of the tree will frequently be the result.

The soil for filling-in should be taken from an old pasture, or along roadsides, first paring off the sod. This, with the addition of a little sand, unless the soil is naturally very light, is, without doubt, the most suitable that can be used. When convenient, peat, from

an old swamp, that has been exposed in a heap to the frosts of at least one winter, and well decomposed leaf-mould, in limited quantities, will also prove beneficial.

When fertilizing materials are used, they should be applied to the surface, that the rains may carry the necessary ingredients contained therein to the proximity of the roots, which then gradually absorb the nourishment by degrees, and are not entirely suffocated, as is often the case when an impatient planter indulges his passion for fertilizing, at the expense of his favorite tree.

After planting, it is highly necessary that the tree should be securely fastened to stakes, for the purpose of preventing the action of strong winds from displacing it; and, at the same time, it should be borne in mind, that the bark must be protected by straw bands or matting, to prevent rubbing.

After carefully experimenting and watching with interest for many years the proper season for transplanting evergreens, the author is compelled to add that so great a diversity of sentiment is apparent among intelligent planters, that to advance any proposition as infallible would be entirely absurd; and yet no question is so frequently asked a nurseryman as this.

We know that many of our best cultivators frequently advance theories that are exactly contrary to those that we advocate, but as we are desirous of adhering strictly to well-known facts, and recording the results of our own experience in support of them, we request an impartial trial of our doctrines before they are condemned.

The generality of the order, among which are the Pines and Firs, form and perfect their growth by midsummer. At that period, during a long and rainy season, they may be removed with excellent success; but, should a drought set in, woe betide the poor tree, for all the waterings and mulchings that the anxious owner can bestow upon his favorite, will not avail;—the plant will almost certainly

die. But we are quite willing to acknowledge that many hundreds of these trees are annually removed during this season, with entire success, and notwithstanding this, we repeat, local conditions are needed to insure success.

While a tree belonging to another order is removed early in the spring successfully, the structure of the Coniferæ family is such, that an evergreen, transplanted at the same time, would doubtless fail. When the case is reversed and each is planted after the soil has become warmed by the sun's rays late in the season, and the trees show indications of growing, the latter will prove most decidedly more certain. This is a practical view of the case, and may be relied on. In a comparison of spring and autumn planting, the former season has long since been decided to be the most certain for removing evergreens in this climate.

The following extract from Lindley's Theory of Horticulture gives an English author's views, although we differ from him in the above mentioned particular. "As evergreens are never deprived of their leaves, so they are never incapable of forming roots; on the contrary, they produce them all winter long, and rapidly at any other period of the year which is favorable to their growth; so that they are capable of making good an injury to their roots much more speedily than deciduous plants, especially as, in the majority of cases, the roots are numerous and fibrous, and not so liable to extensive mutilation when transplanted. Now, if an evergreen is planted in the month of May, and the weather *happens* to be cloudy, mild, and damp, as the plant is just then commencing the renewal of its growth, and is forming fresh roots abundantly, if such a state of weather lasts for a week or two, there is no doubt the plant will succeed very well, and so it will if removed at midsummer." Again, the same author, remarks: "In short, I am certain that, if experience only is looked to, it will give the same answer as

theory to the question of what season is the best for planting evergreens, namely: that which is best for other trees; and such cases to the contrary as may appear to exist, will always be found exceptions to the rule, in consequence of some peculiar circumstances attending them; not unfrequently, I believe, from the operation having been performed upon a very small number of plants, to the removal of which a degree of care was given wholly incompatible with general and extensive practice."

The editor of the American edition of Lindley's work, the late A. J. Downing, thus comments upon the foregoing: "These remarks must be received with great modification, especially in the Northern and Eastern States. The moist or rainy winters of England are the exact opposite of our cold and dry ones, during which, for two months at least, the soil is severely frozen, and vegetation is nearly or quite dormant. Our whole experience goes to prove that the practice of transplanting evergreens in autumn is, for this country, extremely injudicious, as the damage which the trees sustain in their removal greatly increases their susceptibility to injury by the cold of winter. The early spring is the most favorable period for the purpose, since the abundant and long continued rains which occur from the vernal equinox to the middle of April, enable the plant to recover itself and emit new roots with rapidity. We have been very successful in May, but then so much depends upon the occurrence of rainy weather that the risk is greatly increased. Next to the selection of the proper time, the preservation of the roots in a moist condition is the most essential point in removing all evergreen trees."

As far as these remarks apply to the superiority of spring over autumn planting, they have our decided approval; but we cannot coincide with the writer's views in advocating an *early* spring removal. Practice has fully proven to us the utility of performing the operation about

the time the buds commence perceptibly to swell; at that period the trees, when transplanted, start immediately into action and perform their functions in the new soil; on the other hand, the peculiar fleshy texture of the roots renders them remarkably impatient of being in a state of inactivity at such a period, and they will frequently perish from this cause, as is instanced in very early spring planting.

The tenacity of life in the *Coniferæ* is certainly less than in most deciduous trees; therefore great care should be taken to always preserve the roots fresh and moist, when out of the ground. They evince at this critical season a strong desire for moisture, not only at their roots, but over their whole foliage. Trees, when removed during rainy weather, always succeed better than during a dry season.

Another evil practice is the careless manner in which trees are too frequently taken up, sufficient care not being exercised to preserve the root fibres, as many ignorant gardeners deem the larger roots sufficient to maintain the life of the tree. In regard to this practice, Lindley says: "It would be the duty of the gardener to save every minute fibre of the roots, if it were practicable; but as this is not the case, his care must be confined to lifting his trees with the least possible destruction of those important organs; remembering always that it is not by the coarse, old, woody roots that the absorption of food is carried on, but by the younger parts." Now, when these small rootlets are cut off by the spade during the digging process, every one so destroyed removes one of the vital organs of the tree, and lessens its chances of living.

After removing a tree that has been growing in a situation for one year, the ends of all such cut roots will be found supplied with a new set of fibres; plainly showing that nature has endeavored to return to her fixed laws, relative to the growth of plants.

An error into which many unpractised planters frequent-

ly fall, is that of planting large trees; and it is one which we consider so opposed to sound common sense, that it should meet with disapproval from every true friend of arboriculture. We are well aware that the owner of every new place is anxious to produce what is usually known as an *immediate effect*, and therefore he at once proceeds to plant large evergreens, covering his grounds with great, unsightly trees, swaying about with the wind, and in most cases destitute of branchlets or leaves on the lower limbs. Such a system as this may produce an immediate effect, but it is certainly opposed to good taste.

Men of experience seldom desire such trees, knowing full well the baneful effects of transplanting large evergreens. In almost every case of this kind, the lower limbs are apt to die, and thus greatly disfigure the symmetry of the tree.

The Pine family proper, in such cases, invariably shed their foliage on all the lower branches, and forever after present a pitiable sight.

Young and healthy plants, when carefully taken up and as properly replanted, are never subject to this disfigurement, and are almost certain to form handsome specimens.

Before leaving this subject, we desire to give a few directions for transplanting young seedling evergreens from the woods. Much disappointment very frequently results from the performance of this operation, notwithstanding it should be entirely successful if the proper conditions are observed. Such seedlings, it is well known, are generally found in moist, shady localities, and, as is very reasonable to suppose, are utterly unable to withstand the heat of the sun after removal, or comparative dryness in the soil.

After digging (not pulling) the plants, especial care is necessary that the roots be properly protected and not allowed to become in the least dry, as this is the most essential point in the whole transaction. They should then be carefully packed in damp moss, with numerous holes in

the box, to allow free circulation of air and prevent decomposition.

The soil in planting must be light and deep, well pulverized, and in a shady situation, such as the north side of a building.

The plants should be set in beds very thickly, after dipping the roots in a puddle of thin mud. As a covering we prefer evergreen boughs, raised about three feet above the plants on a rough trellis work. In this manner we have succeeded admirably with all kinds of young evergreens, and especially with Hemlock Spruce and American Yew, which are generally considered to be the most impatient of removal.

CHAPTER III.

PROPAGATION.

The propagation of the Coniferæ is, perhaps, the most difficult, and the least understood, of that of any order of plants grown by our nurserymen. The vicissitudes of a changeable and severe climate, with its consequent cold and wet winters, followed by hot and dry summers, render the operation extremely precarious and uncertain, even under the hands of the most experienced propagator. Foreign gardeners upon their arrival in this country, feel confident the difficulties have been overrated, and therefore proceed in the course practised in the old country; a very short experience, however, convinces them of their mistake, and compels a resort to artificial means to accomplish what they have been accustomed at home to leave to nature.

Conifers are increased by the seed, by cuttings, layers, and grafts.

SEEDLINGS.—“A seed,” says Lindley, “is a living body separated from its parent, and capable of growing into a new individual of the same species. It is a reproductive fragment, or vital point, containing within itself all the elements of life, which, however, can only be called into action by special circumstances.” It is important to know what external causes affect the vitality of seeds, and induce or retard their germination.

A seed contains a delicate little embryo, which consists of cotyledons or seed-leaves, and a radicle or primary stem,

in a quiescent state, always ready to start into action if subjected to certain conditions that are absolutely necessary to awaken it into active life. The structure of seeds, particularly in the thickness of their integuments, varies so widely in the different species, that it is necessary to study closely the characteristics of each, and follow a distinct course with the different kinds. For instance, many acorns germinate so readily, that the merest contact with moisture is sufficient to start vegetation; but, on the other hand, the seeds of Holly and others with hard shells, will often lie dormant in the ground for three and four years.

The embryo in many of the Coniferæ differs from that of most other exogenous plants in having more than two cotyledons, or seed-leaves. While the seedlings of some present only two seed-leaves, in others there will be a whorl of several—sometimes as many as fifteen. Fig. 1 shows a young seedling of Norway Spruce just germinating.

A perfectly ripened seed will retain its vitality just so long as the various substances composing it, such as starch, oils, etc., can be preserved from decomposition. For this reason the seeds of Conifers are generally difficult to preserve unimpaired for a long time, owing to the excess of oil they contain. Seeds produced by this order should, *invariably, if possible*, be allowed to remain in the cones until wanted for planting, as no artificial package can supply the place of these natural receptacles.

Darkness, although not in all cases a necessary condition in the germination of seeds, is, however, important; as in the absence of light the chemical changes take place



Fig. 1.—GERMINATING SEED.

more freely, and, consequently, the embryo is brought into action more readily. The practice of old gardeners of placing their seeds on cotton in a vessel of water, for the purpose of testing their vitality, is well known; and we have seen acorns, while on the parent tree, sprouting. But these are only illustrations showing how readily some seeds germinate, and should be regarded as exceptions to the general rule.

If seeds of the Coniferæ are to be sent long distances, they must be protected from contact with moisture, whether in the air, or in the packing material. An excellent method for protecting seeds from the atmosphere is to place them in a tightly corked bottle; but this plan has its disadvantages and is deprecated by many, but for limited periods we have seen excellent success result from it. Various plans and suggestions have been offered by men of experience for transporting seeds, yet none are entirely infallible. Probably the best method is that recommended by Prof. Lindley. He says: "Upon the whole, the only mode which is calculated to meet all the circumstances to which seeds are exposed during a voyage, is, to dry them as thoroughly as possible, enclose them in coarse paper, and to pack the papers themselves very loosely in coarse canvass bags, not enclosed in boxes, but freely exposed to the air; and to insure their transmission in some dry, well ventilated place.

"Thus, if the seeds are originally dried incompletely, they will become further dried on their passage; if the seed-paper is damp, as it almost always is, the moisture will fly off through the sides of the bags, and will not stagnate around the seeds." The same authority states: "For seeds containing oily matter, which are peculiarly liable to destruction (by their oil becoming rancid), ramming in dry earth has been found advantageous." Our own experience with this latter plan has been very satis-

factory; and we have likewise found pure, dry sand useful for the same purpose.

Warmth and moisture are the principal agents that induce germination, but a superabundance of either just as readily causes decay. The moment seeds are placed in contact with moisture, they absorb oxygen, the starch and other compounds are decomposed, carbonic acid is given off, and the development of the embryo plant commences. It is also necessary that a certain degree of heat should attend the operation, and the amount varies in different species of plants; therefore no definite rule can be given, but the judgment of the propagator must be exercised to prevent an excess, and, what is equally requisite, preserve a sufficient amount of warmth in the soil.

Most seeds of the Coniferæ germinate easily, but the young plants are so sensitive to adverse circumstances, such as dampness, heat, drought, etc., that they are exceedingly liable to be lost before forming their true leaves. This is *the* critical point in raising seedlings; for, after the plumule has developed into leaves, and the radicle has formed sufficient fibres to nourish the young plantlet, the danger is chiefly past and less care is required in its growth.

Seeds should always be sown thinly and evenly for several reasons. If the young plants stand too close to each other, a portion are shaded, which not only draws them up with long stems, but in many cases destroys them entirely. The stronger also abstract the nutriment from the soil, to the detriment of the weaker plants, and the latter very soon become stunted and often worthless.

A high temperature is decidedly unfavorable to the growth of seedling Conifers, and, for this reason, the seed, when planted in the open ground, should either be sown in the autumn, or, as some of our best propagators now prefer, as early in the spring as the frost will allow.

These observations of course do not apply to natives of tropical climates, for the temperature in growing these must be so graduated as to suit the nature of the plant. As an excess of moisture is one of the greatest evils to be guarded against, especial care must invariably be taken that the soil during the critical season is only sufficiently damp to preserve the young seedling from wilting, whilst the humidity in the atmosphere (when the beds are covered with sash) may be maintained by syringing slightly, or watering through a fine rose. In fact, water should never be applied in large quantities, as if the young plants were radishes or cucumbers, but as gently as possible, to imitate an invigorating dew.

Dryness, on the other extreme, is almost sure to produce decay; for when young evergreens once suffer for want of moisture in the soil, they rarely recover, and occasionally the sudden transition from drought to dampness kills them almost immediately.

Although a large proportion of the seeds produced by the Coniferæ will germinate readily, the Yews appear to be an exception. The hard, bony integuments of their seeds closely resemble those of the Thorns, and consequently require to be sown immediately after gathering. Our plan is to wash the pulp from the seed, and sow at once in light, sandy soil, either in boxes or frames. The English method is to throw the fruit into heaps, when the soft, pulpy disks soon rot, and the seed is then treated as above. Should the seeds become dry before sowing, they will frequently lie in the ground for two and even three years before germination takes place.

Seeds of the Cypress germinate and grow in a few weeks after sowing, but the Thujas, if not sown immediately after ripening, will lie in the ground for a year. Junipers, if not washed from their pulpy covering, will keep for several years; but they are very slow about sprouting, and will usually lie in the ground for two years.

A peculiarity of the cones of the Cedar of Lebanon is the length of time necessary to perfect them. They are generally not matured until the third year, and the seeds will keep well for five or six years afterward, provided they are left undisturbed in the cones.

The seeds of some species as, for instance, those of the Cedar of Lebanon and several species of Pines, are extremely difficult to dislodge from the cones. When this is the case, the cones should be thrown into hot water for a short time, which will loosen the scales, or a wedge may be driven through the centre and the seeds obtained from the fragments. In the use of hot water, great care should be exercised that the seeds receive no injury. Cones are also frequently dried in the sun, or placed in a moderately warm kiln in order to procure the seeds.

Seeds are often sown too deep, and perhaps as much disappointment arises from this cause as any other. Most seeds of the Coniferæ require but a light covering, say from one-quarter to one-half an inch in depth.

An excellent compost for growing seedling Conifers is sods, muck, and coarse sand, with a small portion of old, well-rotted manure; the whole thoroughly incorporated, and allowed to remain in a heap at least one year before using. An occasional stirring of the mass is advisable. This should never be run through a sieve, but used in a rough state, simply pulverizing the larger lumps. The idea is to have well-rotted, fibrous earth, rich in vegetable, fertilizing material, coarse and light, with a perfect drainage when in use.

For growing the common varieties of evergreens, all that is needed is a simple cold frame with sash. The soil should be dug in the autumn, and prepared very nicely by working sand and well-rotted manure through it; but never, under any circumstances, fresh manure from the stables. The surface should then be raked evenly and smoothly, and the seeds *thinly* sown. We prefer pressing them into

the fresh soil with the back of the spade, and covering with a thin layer of earth, then moistening with water from a fine rose. Care must be taken through the winter to prevent the attacks of mice, which are exceedingly partial to oily seeds. An occasional airing on mild days will be beneficial; and should the soil become dry, a slight sprinkling will be necessary. As the warm days of spring approach, the young seedlings will commence showing themselves above ground, and the attention of the gardener is demanded at this particular period. A slight lifting of the sashes during the warmer portions of the day, careful syringing, and an occasional watering, will be necessary. As the plants mature their wood, the sash may be dispensed with, for the critical season will be past.

An excellent plan for growing rare species is to sow the seeds during the autumn in boxes of light, sandy loam, that is entirely devoid of any stimulating manures, care being taken that the seeds are placed thinly over the surface and not covered too deeply; also that the boxes have perfect drainage. By placing them under the staging of a cool green-house, and keeping them moderately moist, *but never wet*, the young plants will make their appearance quite early in the spring. Especial care is required at this critical period that the soil be neither too wet nor yet too dry; either extreme will prove fatal to the seedlings. One year old plants may be set out in a cold frame, or planted singly in small pots, according to the rarity of the kind.

The following process, as recommended by T. Meehan, Editor of the Gardener's Monthly, we have thoroughly tested and found to possess unusual merits:

"A common board frame is placed over a carefully prepared bed of light mould, and covered with shaded hot-bed sash. Under each corner of the frame is placed a prop, raising the bottom about three inches above the surface of the ground. The advantages of this contrivance

will at once be appreciated when we consider that the most essential conditions in raising evergreen seedlings are to obtain a moist atmosphere, protection from the direct rays of the sun, and at the same time a free circulation of air through the plants."

The satisfactory manner in which the above plan answers all of these requisites, the small amount of labor, and little expense attending it, should recommend it for general use.

CUTTINGS.—We are aware that cuttings of some species of plants root very readily, and others cannot be made to grow with all the skill and attention that can possibly be bestowed upon them. The family of Conifers furnishes excellent illustrations of both the above extremes. We have noticed trimmings of Siberian Arbor Vitæ that had been thrown into the rubbish heap, rooting in the refuse mass, and forming young plants without any artificial help; but on the other hand, the Pines are exceedingly difficult to propagate by cuttings, even under the most advantageous circumstances. Occasionally we find instances in the same genus, as for example among the Junipers, where some of the species are propagated by the thousands from cuttings, with little or no artificial heat, and yet others invariably refuse to root under the best systems known to gardeners.

Among the *Abietineæ*, the Pines are perhaps the most difficult to increase by cuttings; the Larches will grow rather more easily; the Cedars are more tractable still; and the Spruces, with some few species of Firs, the most easy of the sub-order. The *Cunninghamia* is not very difficult to increase by cuttings, but the *Araucaria* we find very stubborn.

In the *Cupressineæ*, all the members root more or less readily. Commencing with the American Arbor Vitæ which is the easiest of all Conifers to root, we next rank the greater portion of the Junipers. The Chinese Arbor Vitæ, (*Biota*), of which the golden variety is a fair exam-

ple, requires more heat, and our best propagators very frequently lose a large proportion of their cuttings. The *Thuiopsis* strikes quite readily. The Cypress, Japan Cedar (*Cryptomeria*), Mammoth Tree (*Sequoia*), and Libocedrus, are quite uncertain,—some seasons giving us a few young plants, but more frequently failing badly.

In the *Taxineæ*, or drupaceous-fruited Conifers, the propagator has a wide and interesting field for experiment, as they can all be grown from cuttings with varying success. The Yews, (*Taxus*), are grown, if given reasonable care, with possibly one exception,—the *Taxus adpressa*. The *Torreya*, *Cephalotaxus*, *Dacridium*, and *Podocarpus*, are rather more easily rooted; and the *Salisburia*, (a deciduous-leaved genus,) may be increased with profit if sufficient care be exercised. In every genus, however, there are always some species more tractable than others, although depending in a great measure on the state of the atmosphere where they are grown, the requisite amount of heat, humidity, etc. This can only be ascertained by trial, as it varies according to circumstances.

As a rule, all plants having variegated leaves are difficult to manage; for, whilst the Siberian *Arbor Vitæ* roots by mere contact with warm and moist earth, the variegated-leaved varieties with the best of care rarely ever succeed. To this statement, however, we find one exception, as the variegated Yews form roots much sooner, and with less attention, than any others of the sub-order *Taxineæ*. So also we find in the same immediate genus a curious problem to solve. The *Abies Menziesii* roots very easily, and the *A. Douglasii* and *A. Canadensis* act just the reverse. The *Biota Orientalis* is not very difficult to propagate, but its variety, *pendula*, is most certain to “damp off” and die. The Irish Juniper is quite easy to manage, and yet the Chinese species will scarcely ever succeed under the best of treatment. *Picea Fraseri* is exceedingly sensitive of the moist sand, but its

variety, *Hudsonia*, roots without trouble; and so on we might multiply cases, but the above sufficiently exemplify our meaning.

We now notice the structure for producing the conditions to ensure success. In erecting a propagating house, that heated by hot water has been usually considered best adapted for evergreens. It not only gives us a more even temperature, but it is always charged with moisture, and this the evergreen cutting particularly enjoys; but an excess of humidity must likewise be carefully avoided, to prevent "damping off," an evil serious in its nature and greatly to be dreaded. We merely desire sufficient moisture to overcome the frequently dry atmosphere of an artificially heated apartment.

In the case of hot air flues being used for heating propagating beds, it is advisable to introduce pans filled with water, to supply the necessary humidity, and as this heating arrangement is more cheaply constructed than the hot water tanks, many intelligent gardeners are dispensing with the latter altogether. In either case, it is desirable to have the least amount of sand that can be used without actually allowing the base of the cutting to touch the boards of the cutting bench.

Those who have not the more modern conveniences for striking cuttings may succeed reasonably well in a common hot-bed; the cuttings are first placed in boxes of sand early in the season, and then allowed to stand for some time in a cool place previous to applying the bottom heat. This method may do for the *Arbor Vitæ*, and some few others that form roots easily. *Siberian Arbor Vitæ*, as well as the *Tree Box* (not a *Conifer*), will often succeed in the open air in a moist, shady spot; but this cannot be relied on every season, and never sufficiently to repay the commercial grower.

In preparing the cutting for use, there is one important point frequently overlooked by propagators, and that is to

use ripened wood only. We have often—we may say very generally—noticed after a few weeks' insertion quite a number of the Irish Juniper cuttings, for instance, turning yellow, and the lower portion in a state of decay. This is almost always attributed to the use of unripe wood, and consequently the open spaces in the beds might have been in a great measure avoided by throwing such weak succulent growth on the brush heap. Cuttings are generally prepared too small. We prefer them large and vigorous, with all the immature tips removed down to the ripened wood; the latter being easily distinguished by the light-brown color of the bark, whereas the younger and unripened shoots are of a pale yellowish-green.



Fig. 2.

The cutting with a heel, Figure 2, is perhaps the best, and should always be selected when the subject is difficult to manage; but in growing the easier kinds, such as *Arbor Vitæ* and Junipers, it is unnecessary and expensive. Although opposed to all good rules, and calculated to encourage negligence in the young gardener, yet the practice of carefully taking off every leaf on the lower end of the cuttings of Irish Junipers is superfluous, and may be avoided where time is everything to the energetic nurseryman. We have always been careful to have every leaf cut off as smoothly as possible, and never to allow a rough or jagged edge to appear on any part of the cutting; but we feel bound to confess that the best strike we ever saw was in a bed of cuttings prepared in a very careless manner, by merely placing them on a board and drawing the blade of a knife close along the stem, severing at one cut all the leaves. Nevertheless, we believe too much care cannot be exercised in making a smooth, clean cut at the base of the shoot, and we always desire the knife to be as sharp and smooth as possible. Most propagators make this lower cut squarely across the wood, but we prefer

it to be slightly oblique, as shown in Figure 3. Some Conifers have long *decurrent* leaves, adnate to the branches; or, in other words, the base of the leaf is prolonged, and adheres tightly to the shoot for some distance from the point of insertion. When instances of this kind occur, we make the lower incisions directly beneath two opposite leaves, as in Figure 4. This method is especially applicable to the *Cryptomeria*, etc. Figure 5, *A*, represents a cutting of *Juniper* ready for placing in the sand of the cutting bench.



Fig. 3.

Different species of evergreens often require entirely opposite systems of management during the rooting stage, particularly in the degree of heat necessary to cause the formation of roots without injury to the cutting. The Golden Arbor Vitæ will perhaps endure a higher temperature than any other; also, *Cupressus Lawsoniana*, *C. Nootkaensis*, and some few others, like a warm place. Junipers do not relish so strong a heat, but will passively endure it, whilst the different American Arbor Vitæs always succeed best in a temperate atmosphere. However, all evergreen cuttings should be brought forward by degrees, and the heat raised very gradually in all instances. A sudden change from cold to heat often proves disastrous.



Fig. 4.

The process of rooting commences first by granulation, or callusing, which is followed by the roots and leaves almost simultaneously developing themselves. It is therefore of primary importance that the cutting should form its granulation before the process of vegetation becomes active; and this is only accomplished by allowing it to be in a cool temperature, for a short time previous to being forced. The callus at the base of the cutting is shown in Figure 5, *B*, and in *C*, of the same figure, the roots have commenced to form.



Fig. 5.—PROPAGATION BY CUTTINGS.—A, CUTTING PREPARED; B, THE SAME CALLUSED; C, THE ROOTS FORMING.

The most successful method of striking cuttings of the Coniferæ is as follows: During the callusing season they should be preserved cool, and the buds prevented from swelling; but when the action of the sap forces the growth of the cutting, the atmosphere must be kept moist and warm. The waterings and syringings should also be frequent, but care must be taken that the drainage is perfect; otherwise, they will assuredly rot.

The callusing process, which soon ensues after heat is applied, is no criterion that the cutting is about to root, as they will frequently stand for two years in a perfectly quiescent state; the large, spongy excrescence at the bottom gradually enlarging until it has to be removed altogether. The Yews are striking examples of this peculiarity, especially the *T. adpressa*; and, therefore, for the purpose of assisting Nature in her endeavors to form these secondary roots, we remove a portion of the uncouth callus by making a smooth perpendicular cut through the mass, and frequently roots will then emanate from the cut edges in a short time.

Evergreens are sometimes grown from what are termed "soft-wood" cuttings, that is, the young wood in a growing state. These are rarely successful if taken from a plant growing in the open air; but when the old plant forms its new growth under glass, the shoots are then suitable for the operation, and the method is certainly desirable for increasing our stock of new and rare trees. The Lawson's Cypress, which is extremely difficult to grow by the usual mode, succeeds tolerably well under this treatment. The proper season for preparing and setting evergreen cuttings is during the months of October and November, leaving them cool and passive until severe weather sets in, when the heat may be gradually applied until the necessary degree shall be attained.

In conclusion we desire to add, that as the foregoing sketch is intended only as a guide to the beginner, he will

soon learn very many little ideas in connection with the business which cannot be found in books. Application and energy are the most valuable assistants, and with these he will soon become expert.

LAYERS.—As this method is so seldom practised on evergreens, excepting to increase the dwarf, trailing species, or an occasional limb on the taller kinds, it is not necessary to devote much space to its discussion. The usual mode of layering deciduous plants is also practised on these; and as an additional inducement to cause the formation of roots, we would advise a slight covering of evergreen branches as a protection from the sun, and to prevent a too sudden evaporation of moisture from the soil. A sudden twist will answer the purpose of checking the sap much better than the usual method of tonguing. As a rule, most plants with variegated leaves are difficult to strike from cuttings, so that we are obliged to resort to other modes. In such cases pots or boxes may be elevated to a level with the branches that we desire to operate on, and the young shoots be layered in them, bearing in mind that they will frequently require attention to prevent the soil from becoming too dry. A protection must always be given them, as mentioned above.

GRAFTING.—As a means of reproduction among evergreens, grafting is the most difficult and least certain plan in use. In the moist, even temperature of France and England, it is prosecuted with great success; but our variable climate prohibits the use of it to any great extent. Under glass, where the temperature can be regulated to suit the operation, grafting, in some cases, is expedient.

It should always be borne in mind when selecting stocks, that some species in a genus are more closely related than are others. For instance, the pines are generally divided into groups, and each group has particular characteristics, or idiosyncracies, that bind them together.

Taking the White Pine (*P. Strobus*) as an illustration,

we find that this and the *P. excelsa*, *P. Lambertiana*, *P. monticola*, and others, have many peculiarities in common. They have each five leaves in a sheath, and are similar in appearance. Their cones are long, with the scales not thickened at the apex. The habit of the trees is also much alike. The White Pine serves as a stock for all these. So with the Scotch Pine, (*Pinus sylvestris*), which is suited as a stock to the related species *P. Banksiana*, *P. pumilio*, *P. pungens*, and others.

The following method for grafting evergreens we have practised for several years, and consider it the most certain and easily performed. Having, during the previous autumn, potted the plants to be used as stocks, and wintered them in a cool frame, they may be gradually forced into growth toward spring. When the buds commence to swell, the plant is in a suitable condition for the operation. In all cases the graft should



Fig. 6.—GRAFTING EVERGREENS.

be perfectly dormant, and the stock in a slightly growing condition. Having prepared the scion by smoothly cutting the lower end into a wedge-shape, the incision is then made in the side of the stock with a *clean, smooth*, downward cut. In placing the scion in the incision, particular care must be taken that the bark of each exactly corresponds. The grafts should be tightly fastened by strips of bass bark, or soft woollen strings, and the whole wound completely covered with grafting wax or waxed paper. This kind of grafting is shown in Figure 6, the tying material being omitted in order to show the manner of making the cut.

The plants must be placed in a cool, shady situation for about two weeks, and then gently forced on a mild hot-bed with the glass shaded; always keeping up a moist atmosphere by frequent syringing. The pots should be frequently examined to prevent excessive dryness, or the opposite extreme, either being exceedingly dangerous to the success of the operation. When the grafts have started into growth, the strings may be cut, and in a short time the stock headed down. In the engraving, Fig. 6, the branches of the stock are represented as cut off, merely to take up less room on the page; it is only when the graft shows that it has formed a union that the stock is cut back, and then it is separated by a smooth cut close to the point of insertion of the graft.

The French practise grafting evergreens by using young, succulent wood; but in this country success is much more certain with the foregoing plan. This *herbaceous grafting* is performed by breaking off the young, brittle wood of the stock a short distance below the terminal bud, and



Fig. 7.—GRAFTING WITH NEW WOOD.

preparing the graft from the young and tender wood of the species to be propagated. The well-known mode of cleft grafting is then employed, and the plant shaded from the rays of the sun and heavy rains until the two are firmly united. Figure 7, from Dubreuil's *Arboriculture*, illustrates the operation. The wood, both in the stock and graft, should have acquired a little toughness before using, but should not be fully ripened.

We have seen excellent success in grafting *Arbor Vitæ* in the open air, by the common method of cleft grafting. The stock in this instance is headed down close to the ground; and after performing the operation, the earth is drawn closely around, leaving the upper portion of the graft only above the surface. An occasional wetting will be sufficient to start it into action. Other methods are practised by gardeners, but differ only in minor details from these described.

CHAPTER IV.

PRUNING AND AFTER-MANAGEMENT.

With fruit trees, summer pinching, as well as limb and root pruning, are often resorted to for the purpose of producing fruitfulness; but in the case of ornamental trees, pruning is seldom necessary, except to preserve a symmetrical shape and to remove all unhealthy or dead branches.

The entire system of pruning a Conifer depends very much upon the same principles that govern the trees of other classes, with the exception that almost every species of the Coniferæ has a tendency to the conical form, and this peculiarity should therefore always be encouraged during the trimming process.

Many a cultivator, through a mistaken idea of beauty, utterly spoils his trees by pruning off the lower branches, and thus forming a long, naked body to the tree, most disagreeable to the eye of an intelligent planter.

In pruning the branches of an evergreen, always select a strong bud to cut back to, thus allowing a chance for the limb to start apparently from the end bud, and thus prevent the artificial means that have been employed from being observed. An excellent plan to preserve a perfect shape, is to extract the centre bud from any shoot that projects beyond the proper limits. The remaining buds will form branches which are induced to spread apart, and in a dif-

ferent direction from the one to which the leader or main shoot inclined. This method of extracting buds is also successfully followed to produce a more dense growth in many evergreens that are naturally of an open habit.

Many of the upright growing Junipers as, for instance, *J. communis*, and its varieties, *Hibernica*, *Suecica*, etc., are greatly benefited by an annual pruning of the over-luxuriant branchlets, thereby causing them to thicken, and otherwise vastly improve in appearance. When the leader or main stem of a Conifer becomes destroyed by accident or otherwise, a new one may readily be formed by tying up a lateral in as nearly an upright position as possible. All of the species evidently endeavor to supply the loss either from a dormant bud, or, in many instances, from a prominent one on a side branch; but it is too often the case that two leaders will start and cause a distortion, which is often observed in so-called ornamental trees. The strongest should be selected to remain, and the others cut away as soon as noticed.

When a tree is disposed to lean upon one side, a suitable contrivance to remedy the defect is to fasten one end of a strong wire to the main body of the tree near the top, and secure the other end to a stout stake driven into the ground a short distance off, taking care to wrap the body of the tree with some soft substance, to preserve the bark from injury.

CHAPTER V.

EVERGREEN HEDGES.

Nothing, in our opinion, is so peculiarly attractive in a well kept place, as an evergreen hedge neatly and frequently trimmed ;* and nothing really injures the appearance of a place more than one that is neglected and allowed to grow at will. Either as an ornamental boundary, or for a protective screen, no class of plants can equal those with persistent or evergreen leaves. Always green and cheerful throughout the whole year, an impassable barrier to winds and storms, easily clipped, and remarkably beautiful when properly cared for, of rapid and dense growth, and comparatively free from disease, they comprise indeed nearly all the requisites needed for a hedge.

True, they cannot be formed into a defensive barrier against the incursions of unruly cattle and the depredations of the fruit stealer ; but in beautifying our homes and endeavoring to create additional attractions in their surroundings, we desire something more than the merely practical ; and we therefore insist that there can be no place, however small, but what may receive an added charm by the introduction of a neat evergreen hedge, such as we have described. Such improvements are invariably associated with good taste and refinement.

Evergreen hedges may very properly be divided into two distinct classes, which, in the planting, selection of varieties, and after-management, differ very essentially

from each other: first, those intended strictly for shelter or to conceal unsightly objects; and secondly, the true ornamental hedge. The former requires less care, and is intended mainly for the unfrequented portion of the grounds, and very frequently needs no attention, excepting an occasional clipping of the stronger branches and a heading-in of the taller plants.

What is needed more particularly in a screen or barrier to break the force of storms, is a strong growing, hardy species that is not easily affected by the wind, and such we find in the hardier class of Pines and Spruces; as the White, Scotch, and Austrian Pines, and Norway Spruce.

Although we find the common Red Cedar (*J. Virginiana*), Chinese Arbor Vitæ (*Biota orientalis*), and the common Juniper (*Juniperus communis*), occasionally recommended for this purpose, we are compelled to discourage their use owing to their unfortunate habit of dying out near the base, and thus disfiguring the symmetry of the screen as well as opening a passage for the cold winds. This may not be the case throughout the West, and indeed Dr. Warder, in his work on Hedges and Evergreens, maintains the contrary opinion; but in the Eastern States we have frequently noticed this drawback to their culture. The late William Reid, of Elizabeth, N. J., than whom no more skillful hedge-grower could possibly be found, stated to the writer that these plants would never answer the purpose, and that after several years of patient trial he had entirely given them up. The American Arbor Vitæ (*Thuja occidentalis*) affords an excellent protective screen, in a small place; but on an extensive scale, we prefer the Pines and Spruces.

The true ornamental hedge, to please the eye by its symmetrical proportions, and richness of color, should receive a full amount of care and attention, for the neglect of one season will very frequently cause it to become disfigured

to such a degree as to require several years to rectify the damage caused by the remissness.

After determining the location for the hedge, the ground should be plowed or dug deeply, about four feet (or even more) in width, and the plants set along the centre of the pulverized strip. The proper distance apart for the plants will be determined in a great measure by their size and the species used. We prefer the height from 12 to 15 inches for Arbor Vitæ, Hemlock, and other plants of medium and slender growth. In large screens, this distance must be modified, and the plants set three, four, and even a greater number of feet apart, according to the required density of the screen.

Nothing further is needed during the first season than to trim off the tops of the larger plants, or an occasional side shoot, that projects out further than the main portion of the hedge. Always bear in mind that the ground must be kept scrupulously clear of weeds, and be frequently stirred. Mice very often attack a neglected hedge, but very seldom a clean, well cultivated one. In stirring the soil, the hoe or cultivator should not run so deeply as to destroy the numerous small rootlets with which the Coniferæ are so abundantly furnished. We usually scatter a slight dressing of well-rotted manure over the surface of the soil during the winter, and thus at the same time protect the roots and furnish nutriment for the ensuing season's growth.

The second year the plants ought to make a reasonable growth, and a clipping during the summer will be required in addition to the regular autumnal shearing. If inclined to grow strongly, a frequent trimming will be beneficial, as it should always be the aim of the cultivator to produce an impenetrable mass of foliage, especially at the base of the hedge. The requisite shape should also be given as soon as circumstances will permit.

We prefer the curvilinear form for many reasons, the

most practical of which is its ability to shed a heavy weight of snow that would otherwise adhere, and, by pressing out the side branches, mar the beauty of the hedge. Novices must always bear in mind that it is very easy to produce a tall hedge, but to form one with a close, broad bottom, requires frequent trimming, and a proper amount of attention ; for after the hedge is grown, this cannot be accomplished. In after years, when the hedge arrives at its required height, all that will be necessary is the frequent use of the shears, and due attention to keep the weeds and other strong growing plants clear from the row.

SEASON FOR PRUNING CONIFERS.

Many intelligent cultivators utterly disregard all set times for performing this important operation, under the belief that the best season to trim is when they have the most time to devote to it. There is, no doubt, an advantage to be gained by this course, but there are principles that govern this operation, as well as those of planting, propagating, etc.

In a *young hedge*, for the first two or three years, we do not desire to trim severely, as the object should be to encourage, not weaken the growth, and consequently our own practice has been to cut them but once in the season, say in October, and when the young shoots have ripened, but not by any means after freezing weather sets in. One main reason for not pruning late in the autumn is, that after the external portion of the hedge is removed, the inner and weaker parts are then exposed, which, being in a very tender state, are liable to become injured by evaporation and sudden changes of temperature. In an older hedge, the object in pruning is to weaken growth, and this is best gained by pruning early in the month of June. At that season the unmaturing shoots are suddenly checked by being cut back, and the growth weakened very mate-

rially in consequence. A second trimming is also given the hedge in October, to bring it into shape.

The same principle governs the pruning of specimen evergreens. When we wish to weaken the growth, trim the young shoots early in the season; but on the contrary, if we desire a stronger growth, cut back in the autumn after the shoots are ripened.

Observation and practice will soon teach the operator many facts in relation to this subject that cannot be learned in any other way, as much depends upon the object we desire to accomplish.

CHAPTER VI.

DISEASES OF CONIFERS.

The diseases incident to this order of plants are comparatively very few, and, as a general rule, mostly confined to a few species, and restricted probably to certain conditions of the atmosphere and soil. The causes that influence the appearance and dissemination of a portion of these evils are not at present sufficiently understood; nevertheless we will give the most approved views on the subject, hoping thereby to induce more careful experiments which shall tend to counteract the direful effects of at least a part of these maladies.

As already stated, a rich soil abounding in organic manures, is, no doubt, one of the chief causes that produce unhealthiness in coniferous trees, by inducing a strong succulent growth which rarely allows the young tree sufficient time to mature its wood, and consequently, if not killed by the severe cold, it very frequently becomes in a manner diseased, and after lingering a few years ultimately dies.

Another source of disease, and one also to which we have already called attention, is that of an imperfectly drained soil. Disease often occurs to the tree from this very simple, yet baneful cause, which will eventually destroy its life, although oftentimes it may linger for several years, gradually, though surely, approaching its death. There is no doubt that three-fourths of the diseases common to this family arise from the two causes just alluded to; an unhealthy condition is indicated by the appearance

of moss, lichens, and numerous fungi on the bark, but these are undeniably the effect, and not the cause, thereof.

We frequently find evergreens making short annual growths and losing the foliage on the young wood, or, perhaps, the bark is covered with lichens, and the leaves with minute parasites; yet the primary cause that produces this state of unhealthiness is not apparent. To counteract these diseases, we must consequently commence at the foundation and search for and remove the cause, when all the outward forms incidental thereunto will surely disappear.

Among the most mysterious causes of death in the Coniferae, is that of blight, which has heretofore been generally confined to the White Pine, (*Pinus Strobus*), and a few allied species. So insidious is its approach that we scarcely have become aware of its presence before the tree is lost. Plants that are to all outward appearances perfectly healthy, suddenly turn yellow, the foliage whitish, and death in a very short time ensues. This is the more trying, as other plants closely adjoining still continue to thrive luxuriantly, and by their rich, dark green foliage lull us into fancied security, and then perchance follow the course of their departed companions in a few weeks. The requirements of the *Strobi* group of Pines differ widely from those of any other, and demand certain conditions in the soil, to prevent disease and promote a healthy growth. They will not succeed in a wet, undrained situation; but if light and dry, their future success may safely be depended on.

The most rational cause that we can assign for the appearance of blight in the family of Conifers, is that due to a too luxuriant growth.

One of the newer diseases prevalent among evergreens, and one from which the *Strobi* group of Pines is singularly and entirely exempt, manifests itself as follows: Early in the autumn a few minute spots are noticed at the

apex of the leaves, which gradually extend downward to the base, until they cover almost the entire surface. The leaves finally become so diseased as to fall off, thus leaving a long, bare branch, either completely destitute of foliage, or occasionally with a small tuft of reddish-brown leaves at the extremity. We have noticed that until very recently, trees growing on low, damp grounds, where there was imperfect drainage, were always attacked first. Especially was this the more clearly shown in nursery rows, where we would observe a few trees standing in a spot where, during winter particularly, there was stagnant water about the roots, and whilst these trees would be gradually dying with this mysterious malady, others in the adjoining rows would be perfectly free from its effects.

Within the past year, however, this disease has become less fastidious in its selection of situations, and has assumed more of the character of an epidemic, spreading to trees that were growing in soils exactly the opposite in nature to the above. We have lately observed its appearance on a number of *Pinus Austriaca*, and *P. Laricio*, standing on a dry, gravelly hill-side, where the surface had been washed away by the heavy rains.

To these two extremes of unsuitable soils this disease is almost entirely confined, and rarely can it be observed in such pines as are growing in well prepared ground.

After having examined and patiently studied this unhealthy state of the tree, from the first intimation of disease through its various stages until death ensues, we are obliged to admit that we cannot make any positive statements in regard to its cause or eradication. In the disease under consideration, small spots are perceived on the leaf of the Pine, which spread rapidly until they cover the whole surface. Under a good lens, these spots are discovered to be a very minute fungoid plant, which, finding a suitable condition for its growth, speedily destroys the

leaf. As all vegetable productions when in a *perfectly* healthy state, are free from the numerous parasitic growths that are common to diseased plants or trees, therefore, when any appearance of the lower order of Cryptogamia, such as fungi, mosses, and lichens, becomes visible, something must be assuredly wrong in the functions of the plant itself. This parasitic vegetation is not the primary cause of ill-health, as some imagine, and hence the mischief is performed before these outward forms become apparent; and although these are charged with being the prime instigators, they are in reality but the effect of disease previously contracted by the tree.

The species that we have found to be most easily affected, are the *Pinus Austriaca*, *P. Laricio*, *P. Pyrenaica*, *P. Pallasiana*, with perhaps a few others; and in every case the diseased trees were members of the two-leaved group of Pines.

The disease known as *Etiolation*, or blanching, entirely destroys the verdure of plants, and renders them pale and sickly. This arises from an insufficiency of light. It is mostly observed on such plants as are growing in the dense shade of trees; but may occur from a variety of causes, such as insects nestling in the rootlets and consuming the food of the plant, thus debilitating the leaf so as to render it insusceptible to the action of the light; or the same appearance may arise from extreme poverty of the soil. It is not prevalent, and in the majority of instances may be easily detected and remedied.

Gangrene, however, is of a different nature, and is mostly confined to the half-hardy plants, or such as are easily affected by sudden changes of the atmosphere. It is mainly attributable to two causes, the one arising from an excessively high degree of temperature, the other, from extreme cold. A very low temperature destroys or shrivels the green leaves and shoots, turning them to a dark

brown color; and so will excessive heat destroy their vitality. A too rapid growth of a particular branch will very frequently deprive the one adjoining of its due share of nourishment, and death ensues. Again, certain winds have a disastrous effect on the young shoots; or the early frosts of spring deprive them of life.

CHAPTER VII.

INSECTS INJURIOUS TO CONIFERÆ.

Coniferous trees have some insects peculiar to themselves, and they are also preyed upon by those that are found as well upon a number of deciduous trees. We shall briefly describe the most troublesome of these, and give some hints towards ridding our collections of these destructive pests.

The **Drop-worm**, or **Basket-worm**, (*Oiketicus coniferarum*, of Harris; or *Thyridopterix ephemæreformis*.—The larva of this insect surrounds itself by a case, or “basket,”



Fig. 8.

constructed of the leaves of the trees on which it feeds. These cases are very tough, and likewise difficult to displace from the twig to which they are attached. Fig. 8 shows the case, and Fig. 9 the larva removed from it. When feeding, the worm fastens its curious little house to a twig by means of a few silken threads, which are removed and refastened at pleasure. They will also drop

from one limb to another by means of these threads, and commence their work of destruction in a fresh place.

This terrible little pest, now becoming so well known in this country, was only discovered here a comparatively few years ago, and the above name was given it by Prof.



Fig. 9.

Harris. Although his description would lead one to infer

that it confined its ravages to the Conifers alone, it nevertheless depredates severely on many of the deciduous trees. It is particularly troublesome on the Arbor Vitæ, and in a very short time will completely demolish every vestige of foliage on the plant. We have also seen its silken cases very numerous on the Larch and the Deciduous Cypress, as well as on the Hemlock Spruce.

The little insects are exceedingly numerous, and rapidly multiply if not destroyed when first observed. The young worm is quite timid, and upon the least noise or disturbance of any kind, immediately withdraws into its covering, which closes up tightly at each end, thus securely protecting it.

The female is without wings, and never leaves her chrysalis until her approaching dissolution, which takes place after depositing her eggs in this singular, basket-like case. The male moth is at least $\frac{1}{2}$ inch in length, of a dark brownish color, and is extremely shy and impatient of confinement. Its ordinary shape is shown in Figure 10;



Fig. 10.

it has the power of extending its abdomen after the manner of a telescope, as seen in Figure 11. Immediately upon hatching, early in the spring, the little worms scatter over the surrounding foliage, and each soon prepares a little basket for itself, which is enlarged as its occupant needs more space. The only method of eradicating them is to pick the nests, or baskets, off by hand, and destroy them by burning or otherwise.



Fig. 11.

Galls.—We have noticed, of late, curious resinous galls or excrescences on the ends of the shoots of some Pines, and particularly on the Scotch Pine, which may possibly belong to the *Tortrix*, or some allied genera. Its manner

of living is very similar to that of the *Orthotænia resinella*, of Linnæus, a European moth, described and figured in Loudon's Arboretum, Vol. IV, page 2146. As no certainty has been arrived at in regard to the correct nomenclature of this species, we are unable to pronounce it new, although Köllar, Harris, Fitch, etc., evidently do not describe it. In particular seasons and localities they become quite numerous, and large numbers of these resinous balls may be noticed, always on the extreme end of a main branch, or frequently and disastrously on the main shoot of the tree. The eggs are deposited at the base of the bud, and the worm bores downward for some distance into the branch.

These gall-like excrescences are caused by the exuding resin, and often increase to the size of two inches in diameter.

The moth is usually quite small, of a dull lead color, with broad, entire, fore wings, which form a triangle with the body when at rest, slightly deflexed at the sides and dilated towards the shoulders.

The only plan to destroy them is to examine these excrescences early in the autumn and dislodge the worm, or, if left until spring, the shoot should be cut away and burned.

Plant-lice.—The family of Plant-lice, or *Aphidæ*, are mostly so minute as to be scarcely perceptible to the naked eye, and yet they frequently appear in such immense numbers as to destroy the plants in a short time. These insects cause the foliage on the younger twigs to curl up tightly, and may on this account be very readily detected. Prof. Stauffer, of Lancaster, has detected an undescribed species feeding on the Norway Spruce. Its proboscis is much longer than its body. Another species has lately been found with a shorter proboscis, and differing very essentially from the above. A third species, and distinct from both the foregoing, has a woolly appearance, and is found on the branches of evergreens. In England, the

Aphis juniperi is mentioned as infesting the various Juniper as well as a species of Thrips (*Thrips juniperi*.) To completely destroy these little insects, it is only necessary to drench them well with a solution of whale-oil soap or tobacco water. Perhaps the best and most convenient remedy is hot water a few degrees below the boiling point, which will not injure the plant but effectually destroys these pests.

Scale-Insects.—The Scale-insects are occasionally found on some of the Coniferæ, and more particularly on many of the Junipers. In fact, so injurious are they on some specimens, even of a large size, that we have known the plant to be killed in a single season. They will attack the leaves of pines, particularly if the tree should be in an unhealthy condition. These insects are the most formidable enemies we have to contend with, owing to their peculiar habits.

The visible token by which we recognize the presence of these pests is the scale-like covering; this is in reality the relics of the parents which remain to act as a protection to the young brood; these extract the juices from the tree beneath their tough covering, and kill it gradually. As we cannot apply to the scale any of the various solutions that are employed in killing the Plant-lice, it becomes necessary to scrape them off; and here again another difficulty arises,—for among the multitude of closely imbricated leaves found on the Junipers, this plan is absolutely impossible. The hot water remedy with us is first tried thoroughly, and if that fails to remove these tough little coverings, we proceed to the final resource, that recommended by the old Dutch farmer for killing off the curculio, i. e. "Cut the trees down;" only in our case it has the recommendation of preventing the insects from spreading to other trees in the vicinity.

The Pine-leaf Scale-insect, (*Aspidiotus pinifolia*), is

a new species discovered by Fitch, that preys upon the leaves of the Pine genus, and is very distinct from the scale that infests the Junipers.

An insect, new to the writer, has made its appearance during the past season in large numbers; and although very readily destroyed, it may nevertheless become a great nuisance if not promptly attended to when first observed. They are pale yellowish-green caterpillars, about an inch in length, and feed in communities; in fact, so voracious are they, and so very numerous, that frequently they will clear a young pine of all its foliage in two days. The Dwarf Pine appears to have their preference, although we have met with them on the Scotch, Loblolly, etc. A plentiful deluge of hot water, however, quickly destroys them.

Coleoptera.—We have lately received the following brief but interesting list of “Coleopterous Insects” infesting the Conifers, from Prof. S. S. Rathvon, of Lancaster, Pa., all of which he states have been found in Lancaster and York Counties, Pa., or in Virginia and Maryland, around Washington City, and a few farther north.

“The trunks and roots of some pines (*P. Strobus*, *P. rigida*, etc.,) are often attacked by small white grubs, allied to the common grub of the May-beetle, and will always be found lying on their sides in a semi-circular form. This is especially the case when these parts are affected with decay, although I am not prepared to say that they are the primitive cause of it. These are the larvæ of a small *Melolonthon*, called the ‘Bristle-necked Valgus’ by Dr. Fitch, *Valgus seticallis*, Brauv. The *Valgus serricallis* also attacks the pine, particularly the roots. The larvæ of *Chalcophora Virginiensis*, a rough-bronzed beetle, nearly an inch and a half long, attack the trunks of pines. This insect belongs to the *Buprestidæ*, the larvæ of which are long and flattened, having the anterior segments much developed, in shape something resembling a newly-wrought

horse-shoe nail. Also other species of the same genus, *C. immaculata*; *C. liberta*; *C. novaboracensis*, etc., etc.

"In May and June, on the Pine and Spruce trees, the *Chrysobothris Harrisii* and the *Buprestis aurulenta* appear, (the latter a beautiful green and bronzed beetle), the larvæ boring into the trunks of those trees. There is also the *Buprestis fulvoguttata*, and the *Dicerea punctulata*, which particularly affect the *Pinus rigida*. The *Buprestidæ* are spindle-shaped insects, tapering most towards the hind end, all more or less bronzed beneath; and the larvæ of all of them very similar in shape, white fleshy worms with small or rudimental feet, and a small black, or brown glossy head. *Monohammus notatus*, a 'Long-horned beetle,' in the larva state, bores transversely into pine timber at least, and is also found in decayed or dead parts of standing and living trees.

"The larvæ of some of these 'Long-horns' much resemble those of the *Buprestans*, only they are not so thick in front, and do not narrow so suddenly into the nail, or tad-pole-shape. Also the *M. titillator*, *M. marmoratus*, *M. scutellatus*, etc.; this last named species being more abundant on the northern border of our State, (Pa.)

"Among the *Longicornia*, infesting the different kinds of pine, are also *Eupogonius pinisora*; *Leptostylus comixtus*; *Euderces pini*; *Callidium antenuatum*; *Hylotrupes bagulus*; *Orthosoma Pennsylvanica*, (a large, long, brown beetle); *Tragosoma Harrisii*; *Rhagium lineatum*; *Tomicus xylographus*, *nigricalis*, *niger*, *et fulvus*, *et caligraphus*, *et pini*, *et pusillus*, *et materiarius*, etc., etc. Then we have *Hylurgus tenebrans*; *Hylastis pinifex*, *et carbonarius*; *Hylobius pales*, *et picivorus*, etc. All these insects, both in the larvæ and perfect state, affect the pines immediately under the bark, or in the wood of the trunk and large limbs.

"Affecting the twigs, is the *Pissodes strobi*, a small, black 'Curculio'; but then there are also species belong-

ing to the *Hymenoptera* and *Homoptera*, which affect the leaves as well as the twigs. There are also *Lepidoptera* which do the same, especially the *Toricidæ*. In addition to the aforementioned *Coleoptera*, the following affect the leaves: *Chrysomela Philadelphica*; *Glyptoscellis hirtus*; *Dichelonycha albicollis*; *Anomala pinicola*; and *Metachoma 6-notata*. *Liopus facetus*, and *Hylurgus dentatus*, on the Cedars and Junipers."

There are other insects infesting the *Coniferæ* in this country, but not sufficiently numerous to require special notice. For instance, in the Southern States, Michaux mentions extensive tracts of the finest pines covered only with dead trees, caused by swarms of small insects (probably *Hylopius pales*) which lodge themselves in different parts of the stock, insinuate themselves under the bark, penetrate into the body of the tree, and cause it to perish in the course of the year; but such instances as the above are, perhaps, only local, and occur unfrequently.

CHAPTER VIII.

SITUATION AND SELECTION OF VARIETIES.

In a pecuniary point of view, the planting of evergreens around dwellings is advisable, as they protect them from the violence of the storms, which trees with deciduous leaves are unable to do during the winter months. This important view of the case has been very ably argued by Dr. Warder in his work on "Hedges and Evergreens," and certainly ought to be carried out in practise by our farmers generally.

The above mentioned author, after showing conclusively the great saving that will thus accrue in the matter of fuel alone, recommends farmers to plant belts of evergreens around their barns and farm-houses, for the better preservation of their stock from the inclemencies of the winter, and, particularly, for those living in the far West, on the vast prairies, these belts will, undoubtedly, prove highly economical and useful.

In many instances, throughout England especially, *Pinetums* have been formed, composed entirely of all the species and marked varieties of this order. Where such is the case, we often find many half-hardy plants succeeding, that under ordinary cultivation obstinately refuse to become acclimated.

This is entirely owing to the shelter which the larger growing and hardier kinds afford these natives of a milder climate. Some of the large English *Pinetums* contain specimens of all the rarer species, at the present time, of

fine size; whilst we, from some cause, are almost entirely ignorant of their very existence. In the United States, owing to the want of sufficient enthusiasm, or the need of pecuniary means, such a collection has never been attempted; although there have been a few instances within the past few years where energetic individuals have devoted much time to the subject, and have created quite creditable collections.

To the general planter these specialties are of little interest, and excepting as mere botanical specimens, or for the purpose of testing every known species and variety, not to be recommended. The idea of this work is not to encourage an undue interest in the Coniferæ to the exclusion of other trees, but to enable the uninformed planter to make a judicious selection, which should be systematically planted as recommended by those who have made it a study and are best qualified to judge.

The great diversity of form and color as displayed in this order is calculated, in the hands of a competent person, to create an impression that will always please the eye; but, on the contrary, if undertaken by an unskillful hand, an incongruous mixture will be the result, that not only pains the eye of a person of taste, but in most cases will prove a mortification to the proprietor in after years.

The desire of every owner of a place should be to plant his trees in such a manner as will harmonize with the natural landscape, by a prudent admixture of the varied forms and shades of color. This, if properly done, will be a constant source of satisfaction to himself and others. We do not, however, wish to be understood as recommending a strict observance of the arrangement of trees in our woods; but we do sincerely desire to see a more natural and less artificial system pursued than that so frequently practised by many planters of the present day.

In one of Bayard Taylor's works, he thus beautifully

alludes to the true principles of landscape-gardening: "In the forms and colors of the trees, and their disposition in regard to each other, and to the character of their background, we detect that art which never appears *as art*,—never can offend because it is developed through the ordinary processes of nature. Plant a tree, and it will take, of itself, its own characteristic. Nature, however, can simply produce; she cannot combine and arrange. She will not plant yonder Weeping-ash on the slope, so that its outer boughs shall just touch the water; she will not rear those Purple Beeches to relieve the huge green masses of the ancient Lindens, nor give the Silver Birch an airy lightness and distinctness by a back-ground of Pine. She plants weeds among the flowers, and ripple-grass in the turf; muffles the brook with autumn-leaves; and fills the pond with sickly water-mosses."

Many species appear to much better advantage when grown singly, to allow of a perfect development of shape, whilst others are beautifully calculated to form groups; but in the arrangement of the latter, a guarded care should be exercised to prevent an unsightly, crowded cluster. Downing, in his "Landscape Gardening," says: "Nothing at first thought would appear easier than to arrange a few trees in the form of a natural and beautiful group,—and nothing really is easier to the practised hand. Yet experience has taught us that the generality of persons, in commencing their first essays in ornamental planting, almost invariably crowd their trees into a close, regular *clump*, which has a most formal and unsightly appearance, as different as possible from the easy, flowing outline of the group.

"Natural groups are full of openings and hollows, of trees advancing before or retiring behind each other; all productive of intricacy, of variety, of deep shadows, and brilliant lights."

The great value of evergreens for grouping consists in

the contrast exhibited between them and the round headed class of trees, so that, when two or three Pines or Firs are inserted in the centre of such a group, they produce a beautiful effect. A fine specimen of the Common Hemlock Spruce, when planted on an open space, with generous cultivation, becomes the perfection of beauty in a tree. The rich, dark green foliage, and graceful drooping branches, waving and glistening in the passing breeze, create an impression of quiet elegance.

A frequent error, and one utterly devoid of true taste, is that of planting trees in straight lines. We have in our recollection more than one lawn on which the trees are planted so strictly in right angles, as to remind one of a geometrical figure. In an orchard or garden of fruit trees, this system is expected, and indeed is proper; but on a lawn, it should never be tolerated. Another erroneous practice is that of planting large-sized trees in small door-yards, without taking into consideration their ultimate size. There are a number of evergreens belonging to the smaller class of trees, or large shrubs, that would answer the purpose equally well, which would not grow out of proportion.

No undeviating rules can be laid down to instruct the planter how to arrange his trees correctly; but general principles may be given to prevent confused and meaningless effects. To form plantations according to correct principles and carefully executed ideas belongs to the person of taste.

We conclude this subject by one more extract from the writings of Bayard Taylor, in which he thus alludes most eloquently to the intelligent landscape-gardener: "In his eyes all its features are, to a certain extent, plastic. That which he cannot change or remove, he can throw into perspective, or so conceal by the intervention of other forms, that its individual ugliness shall become a component part of the general beauty. To contracted spaces he can im-

part a character of expansion; dead levels he breaks by picturesque interruptions; he works not alone for the eye, but excites the fancy by stolen glimpses which hint at some concealed charm. He collects the wandering rills, and opens a mirrored under-sky to brighten the too uniform green; he arranges his trees with regard to their forms and tints, to the lights they catch and the shadows they cast, until they stand as far in beauty above the uncultured woods, as the pediment groups of Grecian temples are above a group of ordinary men. He sees, like the sculptor, the suggestions of Nature, and pilfers the graces of a hundred forms, to blend them harmoniously in one ideal. Should not this 'Earth Sculpture' have its place among the Fine Arts?"

CHAPTER IX.

SYNOPSIS OF THE GENERA OF CONIFERÆ.

In order to present the genera described in this work arranged in their proper sub-orders, the following synopsis has been prepared. It is intended as an artificial key to aid in determining the genus to which a plant belongs, rather than as a scientific grouping of the genera. The number placed after the name of the genus refers to its position in the work. The characters of the Family are described at length on page 12, and we here give only a brief recapitulation of them:

NATURAL ORDER CONIFERÆ.—THE PINE FAMILY.

Trees or shrubs with a resinous juice, and mostly linear, scale-formed or awl-shaped, and entire leaves. Flowers, monœcious or diœcious, without calyx or corolla, usually crowded into short, scaly aments. Ovules and seeds, naked. Embryo in the axis of the albumen. Cotyledons, two to many, in a whorl. The wood destitute of ducts, but the fibre marked with numerous circular disks.

SUB-ORDER I.—THE PINE SUB-FAMILY—ABIETINÆ.

Fertile flowers in aments, consisting of scales each from the axil of a bract, and bearing at its base two inverted ovules ; fruit a cone. Buds, scaly.

A Flowers monœcious ; leaves persistent.

* Seeds 2 to each scale of the cone and adherent to it.

Pinus—(PINE.)—1. Leaves needle-shaped ; 2, 3, or 5 in a cluster, with a scaly sheath at base.

Abies—(SPRUCE.—FIR.)—2. Leaves short, needle-shaped, 4-sided or flat, scattered on the branches or somewhat 2-rowed, not clustered ; cones with thin scales.

Cedrus—(CEDAR.)—3. Leaves 4-sided, clustered on the old branches, solitary and scattered on the young shoots; scales of cones deciduous.

* * Seeds varying in number, and free from the scale.

Cunninghamia.—4. Leaves linear-falcate, alternate, decurrent; scales of cone 3-seeded, without bracts.

Sciadopitys.—5. Leaves whorled, elongated, sub-falcate; scales of cone with small bracts, 5 to 9-seeded.

Arthrotaxis.—11. Leaves scale-formed; scales of the cone 3 to 5-seeded, (usually diœcious.)

Sequoia.—6. Leaves oblong awl-shaped or linear, scattered or somewhat two-rowed; scales of cone shield-shaped, 3 to 7-seeded.

B Flowers monœcious; leaves deciduous, clustered on the old branches and solitary on the young shoots.

Larix—(LARCH.)—7. Cones with persistent scales.

Pseudolarix—(FALSE LARCH.)—8. Cones with deciduous and divergent scales.

C Flowers diœcious; leaves persistent.

Araucaria.—9. Leaves scale-formed; anthers with many cells; scales of cone mostly deciduous, with a single adherent seed.

Dammara.—10. Leaves oblong-lanceolate; scales of cone with 1 free seed.

Arthrotaxis.—11. Leaves scale-formed; scales of cone with 3 to 5 free seeds, (sometimes monœcious.)

SUB-ORDER II.—THE CYPRESS SUB-FAMILY.— (CUPRESSINÆ.)

Fertile flowers in aments, consisting of few scales without bracts; scales mostly shield-shaped, and bearing one to several erect ovules; fruit a strobile of few scales or berry-like; buds mostly naked.

A Leaves persistent.

* Fruit berry-like at maturity.

Juniperus—(JUNIPER.)—12. Fruit of few scales, with 1 to 5 ovules at the base of each, ripening into a drupe-like berry.

* * Fruit a small cone, with the scales valvate, i. e., meeting at the edges, but not overlapping.

Widdringtonia.—13. Scales of the cone 4, equal in size, 10-seeded.

Callitris.—14. Scales of the globular, woody cone, 4, the alternate scales smaller, 1 to 2-seeded.

Libocedrus.—15. Scales of the oval, leathery cone, 4, the alternate scales smaller, 1-seeded.

Actinostrobus.—16. Scales of cone 6, equal, 1-seeded.

Frenela.—17. Scales of cone 6, the alternate ones smaller, many seeded.

Fitzroya.—18. Scales of cone 9 (?), in whorls of 3, many seeded.

* * * Fruit a cone, with imbricated or overlapping scales.

Thuja—(AMERICAN ARBOR VITÆ.)—19. Cone ovate; scales leathery, 2-seeded.

Thujopsis.—20. Cone globular; scales woody, 5-seeded.

*** Fruit a cone, with shield-shaped scales, mostly pointed at the apex.

Biota—(CHINESE ARBOR VITÆ.)—21. Cone obovoid; scales leathery, 2-seeded.

Cupressus—(CYPRESS.)—22. Cone globular; scales woody, many seeded; seeds mostly without resinous dots.

Retinispora.—23. As in *Cupressus*, the seeds marked with resinous blotches or cells.

Cryptomeria.—24. Cone globular, woody, with wedge-shaped scales fringed on the edges.

B Leaves deciduous, or nearly so.

Taxodium—(DECIDUOUS CYPRESS.)—25. Leaves in two rows; cones globular; scales shield-shaped, woody.

Glyptostrobus.—26. Leaves scattered; cones oblong; scales leathery, unequal.

SUB-ORDER III.—THE YEW SUB-FAMILY.—
(TAXINEÆ.)

Fertile aments solitary, without an ovary or carpellary scale, and ripening into a drupaceous fruit. Buds scaly.

A Flowers diœcious. * Leaves persistent, linear, or needle-shaped.

Taxus—(YEW.)—27. Seeds nut-like, erect in the centre of an open, fleshy disk; anthers 8-celled.

Torreya.—28. Seeds large, ovoid, and without a fleshy disk; anthers 4-celled.

Cephalotaxus.—29. Seeds similar to *Torreya*, but the fruit in clusters; anthers 3-celled.

Podocarpus.—30. Leaves mostly 1-nerved; seed with a fleshy integument, inverted and attached to thick, fleshy stalks.

** Leaves persistent, scale-like or needle-shape.

Dacrydium.—31. Seeds with a hard, bony covering, erect in a fleshy, disk-like integument.

*** Leaves deciduous, fan-shaped.

Salisburia.—32. Seeds large, with a fleshy disk closely surrounding their base; anthers 2-celled.

B Flowers monœcious. * Leaves persistent, scale-formed.

Phyllocladus.—33. Branchlets flattened and leaf-like; seeds small, nut-like, and partly enclosed at the base by a fleshy disk; anthers 2-celled.

Microcachrys.—34. Leaves in opposite pairs; seeds erect with a thin, dry, membranaceous covering.

** Leaves persistent, linear, and flat.

Saxe-Gothea.—35. Leaves alternate, two-rowed, or scattered; base of the seeds enclosed by a thin membranaceous integument.

*** Leaves persistent, opposite, elliptical or lanceolate, nerveless.

Nageia.—36. Sometimes diœcious; seeds with a thin, bony shell, and enclosed by a fleshy or leathery covering.

CHAPTER X.

THE PINE SUB-FAMILY.—ABIETINÆ.

The general characters of this sub-family are given in the Synopsis on page 70, and we illustrate them by a figure, (Fig. 12,) modified from Richard, of the flowers of the Scotch Pine, (*Pinus sylvestris*). A cluster of sterile aments of the natural size is shown at *a*, and at *b* one of the aments enlarged; the scales of which it is composed are stamens, the back of one of which is seen at *d*, and the front; showing the two anthers, at *c*. A solitary fertile ament at the end of a short branch is shown at *e*; *f* is the same enlarged; *g* is one of the carpellary scales, or open pistils, with its accompanying bract; *h* is a view of the same, with the two inverted ovules at its base. These scales, in ripening, form the cone; a separate cone-scale, with the seeds at the base, is given at *i*.

I.—PINUS, *Linnaeus*.—PINE.

Flowers, monœcious. Sterile aments, in spikes or clusters, formed of numerous stamens on the axis, with very short filaments. Anthers, 2-celled, with a scale-like connective, and opening lengthwise. Fertile aments, solitary or in clusters, and terminal. Fruit, a cone, persistent, and formed of woody imbricated scales. Seeds, nut-like, situated in an excavation at the base of the scales, and mostly winged. Cotyledons, linear, from 3 to 12. Leaves, needle-shaped, almost cylindrical, in clusters of 2, 3, or 5, with a sheath at the base; persistent.

The genus *Pinus* comprises a much larger number of species than any other belonging to the order. The



Fig. 12.—FLOWERS OF *PINUS SYLVESTRIS*, TO ILLUSTRATE THE INFLORESCENCE OF THE PINE SUB-FAMILY—ABIETINEÆ.

recent discoveries in Mexico by Rœzel have added several to the already large list, and although none of these can in all probability be acclimated in the Northern States, very many of them will form highly ornamental trees for more congenial climates, particularly in portions of England and France.

The derivation of the name of this genus is involved in uncertainty; some writers asserting it is derived from the Greek *pinos*, signifying a Pine tree, whilst others contend it came from the Celtic *pen*, a mountain, the natural habitat of the family. The Greek *pion*, meaning fat, in allusion to the resinous oily matter produced, is also a derivation mentioned by some authors. The first is probably correct.

The different members of the genus are found all over the world, and in point of usefulness are unsurpassed by any other belonging to the order.

The resinous secretions contained in the wood render it invaluable for fuel, especially where an intense heat is required. Vast quantities of Pitch Pine, (*P. rigida*), and Red Pine, (*P. resinosa*), are yearly consumed in this manner.

The wood of the Yellow Pine, (*P. mitis*), Long-leaved, or Yellow Pine of the South, (*P. australis*), and White Pine, (*P. Strobus*), is exceedingly valuable, and forms the most important lumber in the markets of this country; whilst that manufactured from the Scotch Pine, (*P. sylvestris*), is celebrated throughout Europe. The important commercial products, such as tar, turpentine, rosin, etc., are principally obtained from the *P. australis*, and other kindred species.

For ornamental purposes, many of the Pines are unsurpassed for beauty, and form magnificent conical trees that create an effect peculiar to themselves. The newer introductions from Northern California and Oregon are perfect specimens of elegance, and as many of them have proven

hardy in this latitude, we may derive great pleasure from their introduction.

In our division of this genus into sections or sub-genera, we follow the excellent plan pursued by Loudon, and adopted by Gordon.



SECT. I.—**BINÆ**.—TWO LEAVES IN A SHEATH

1. P. Austriaca, Hæss.—AUSTRIAN PINE.—Syn. *P. Laricio Austriaca, Endlicher*; *P. nigra, Link.*—Leaves, long, rigid, slender, incurved, sharply mucronate; rich, dark green color, and from short sheaths. Cones, medium size, ($2\frac{1}{2}$ to 3 inches long,) conical, slightly recurved and light brown color. Scales, smooth and shining, with a dull spine in the centre.

According to Gordon, the Austrian Pine “is found on the calcareous mountains in Lower Austria, Styria, Moravia, Corinthia, Transylvania, and in the neighborhood of Mehadia in Banat.” It forms a large, spreading tree, about 120 feet in height, and produces strong timber, which is extensively used in its native localities.

This valuable tree, although of comparatively recent origin, being unknown in Britain previous to the year 1835, has gradually worked its way into public favor, until at the present time it ranks as one of the most popular species, and one of the few well-known Pines that are extensively planted. The numerous, rough branches, are placed regularly around the tree, and impart a massive appearance. The rather long, rigid, dark green leaves, are remarkably beautiful when viewed from a distance; but on the other hand, a very close inspection reveals a coarse and rather rough character, that should prevent its use for planting in the near vicinity of the residence.

The cones are very handsome, being regular in shape, and of a rich brown color, which is heightened by a peculiar glossiness on the surface.

The hardiness with which it stands our climate is also an additional claim for its extended use; as in the coldest winters of our Northern States, and particularly in the most northern portions of them, specimens of this species succeed and thrive as admirably as the natives themselves.

It also adapts itself to almost every soil and situation, but prefers a rich, light loam, with a well drained subsoil, and in such grows rapidly, and speedily forms a tree. Where the soil is retentive of moisture, and consequently becomes sour and soddened, we have seen this species succeeding moderately well, whilst the White Pine, (*P. Strobus*,) planted in the same situation, died outright.

We desire to advocate the claims of the Austrian Pine for planting wherever a strong, hardy evergreen is desired to break the force of the wind from buildings or orchards; and in groups, or for avenues, in particular situations, it is one of the most available trees at our command. Taking into account its rapidity of growth and the certainty with which it will speedily produce an effect, owing also in a great measure to the peculiar prominence of its general outline, we consider it unrivalled for a newly planted lawn.

2. *P. Banksiana*, *Lambert*.—BANKS' OR GRAY PINE.—Syn. *P. rupestris*, *Mx.*; *P. Hudsonica*, *Lamarch.*—Leaves from a very short sheath, one inch long, rigid, divergent, numerous, evenly distributed, and grayish-green in color. Cones nearly two inches in length, ovate-conical, recurved, hard, smooth, light gray color, with almost pointless scales. Seeds, very small, with long wings.

This species, which is a native of our most northern limits of arborescent vegetation, generally forms a large, straggling shrub; but in milder regions grows much larger, and will in favorable situations attain to the height of a small or medium-sized tree. In Canada, and northward to Hudson's Bay, the Gray Pine is frequently met with; and even after all other trees have disappeared, this is occasionally seen growing about three feet high and straggling over the ground.

Dr. Richardson, during his journey to the Arctic Seas, speaks of it as attaining the height of from 20 to 40 feet, and even upwards in favorable situations; and also that he found it occupying dry, sandy soils. He describes it as forming an elegant tree, with long, flexible, spreading branches. Douglas, likewise, mentions it as forming good sized trees in the valleys of the Rocky Mountains.

The timber is remarkably light, with a straight, tough fibre, and according to Dr. Richardson much prized by the Indians for building their canoes, and for other purposes.

For ornamental planting, Nuttall says, "it is prized in Great Britain; but with us, as yet, the appearance of pines is too plebeian, from their abundance and predominance throughout the barren and uncleared lands by which we are still surrounded."

Notwithstanding the existence of this species has been known to botanists for a number of years, and with a knowledge that in England it makes a fine specimen under generous cultivation, we are scarcely aware of its being planted in this country, excepting by a very few enthusiastic botanists, who desire to examine the habit of everything belonging to the order.

Michaux, in his "Sylva," speaks rather disparagingly of its merits. After mentioning the supposed medicinal properties contained in the cones, he remarks: "If this property, which is said to belong also to the fruit of the Black Spruce, is proved to exist, it forms the only merit of a tree too diminutive to be of any other utility." From which assertion we differ, for we know of no other species that is apparently so well adapted for creating a peculiar effect in picturesque landscapes, as the one under notice; and particularly in close proximity to wild, rocky scenery, when it may be allowed to grow as a low, straggling shrub, and thereby appear appropriate.

Michaux certainly never saw it in cultivation, for Loudon thus eulogizes it:

“As an ornamental tree, we think it one of the most interesting of the genus, from the graceful manner in which it throws about its long, flexible, twisted branches, which are generally covered throughout their whole length with twisted, glaucous-green leaves, with here and there a whorl of curiously hooked, horn-like cones. It is one of the hardiest of the *Abietinæ*, enduring in the Fløetbeck Nurseries 12° of Reaumur (5° Fahr.) and therefore it may be safely planted in pinetums in the extreme north, not only of Britain, but of Europe.”

3. *P. Brutia*, Tenore.—CALABRIAN CLUSTER PINE.—Syn. *P. conglomerata*, *Græfer*; quoted by *Lambert*.—Leaves in twos rarely in threes, very long, slender, glabrous, wavy, spreading, about 9 inches long; light green, canaliculate above, convex beneath, serrulate on the margins, terminated by a small callous mucro; sheaths about $\frac{1}{2}$ inch long, persistent, of an ash-brown color, membranaceous, entire round the tops; guarded at bottom with a linear-lanceolate, revolute, bright brown, thread-like, ciliated scale (metamorphosed leaf.) Cones, sessile, generally in clusters, ovate, smooth, brownish, 2 inches to 3 inches long; cones truncate at the apex, flattish, trapezoidal, umbilicate, smooth, obsoletely four-angled; umbilicus, dilated, depressed, somewhat hollow, ash-colored. (*D. Don*.)

A large tree from the Calabrian Mountains, where, according to Prof. Tenore, it attains the height of 70 feet. It is remarkably spreading in its character, and the bright green foliage produces a beautiful effect. After testing its hardiness for several years, it may now be recommended as reliable and quite valuable in a collection of ornamental trees. Many authorities have at different periods been at a loss to determine the true position of this species, and have through an ignorance of its distinctive characters ranked it as a variety of *P. pinaster*, etc.; and Sprengel referred it to that species, without considering it sufficiently marked to even form a variety. It is, however, very distinct in many points. It so closely resembles the *P.*

Halepensis in general appearance, as to be frequently mistaken for that species, although the latter is very uncertain in this climate.

The fruit, however, is very unlike; as that produced by the *P. Brutia* is almost invariably borne in large clusters, and sessile; and the *P. Halepensis* produces its cones solitary or occasionally in pairs, with long footstalks, and likewise forms a smaller tree than the former.

It is one of the foreign species to which little attention has been paid, notwithstanding its merits fully entitle it to the attention of cultivators, and when better known, will certainly be regarded with favor.

Lambert says the timber is very valuable and adapted to a variety of uses.

4. *P. contorta*, Douglas.—TWISTED-BRANCHED PINE.—Leaves, 2 inches long, from a short, dark, imbricated sheath, numerous, rigid, sharply mucronate. Cones, from 2 to 2½ inches long, smooth, ovate, clustered; scales furnished with a caducous muero. Branches, twisted, slender, spreading, and thickly covered with leaves. Buds, very resinous, roundish, obtusely pointed, and brown color.

A rare tree in cultivation, having been quite recently introduced into European collections. Loudon says: "This pine was found by Douglas in North-west America, on swampy ground near the sea-coast; and, abundantly, near Cape Disappointment, and Cape Lookout. Dried specimens, with cones, were sent home in 1825-6-7."

Pinus contorta, says Dr. Parry, "is quite abundant on the crest and slopes of dry sub-alpine ridges, forming the principal part of the forest there, and extending to near the snow line; a symmetrical tree of rapid growth, 30 or 40 feet high, with slim and tapering trunk a foot in diameter, a smoothish, grayish-brown bark, detached in thin scales, and tough but coarse wood, which is liable to warp, and rarely cut into boards."

Other writers have described this species as attaining

the height of from 10 to 20 or 30 feet, and state that it is found along the north-west coast of North America, where it forms a low, straggling bush, not unlike *P. Banksiana*, or poor specimens of *P. inops*. In fact, Hooker considered it as a mere variety of the latter; but other botanists, among whom was the discoverer Douglas, claim it as a true species. We feel not the least hesitancy in placing it as such, since more modern research has given it a just right to the distinction.

Being an inhabitant of the most northern confines of arborescent vegetation, it will certainly prove hardy with us, and for peculiar situations, as well as for producing particular effects in landscape gardening, it may prove of use; but as an ornamental tree, we fear its straggling and crooked branches will prove objectionable.

5. *P. glabra*, Walter.—SPRUCE PINE.—Branches and branchlets, smooth, whitish. Cones, generally solitary, somewhat cylindrical, spines nearly obsolete. In close, rich soil, near Black Oak, South Carolina. (*Ravenel*.)—A tree from 40 to 60 feet high, with smoothish bark and soft white wood, branching from near the ground. Leaves, from 3 to 4 inches long. Cones, about 2 inches long. "Wings of the seed lighter colored, more tapering, longer and less gibbous than those of *P. mitis*." This species of Walter, long overlooked, but lately revived by Mr. Ravenel, is, if I mistake not, not uncommon in the low hummocks of this State (Florida), and is distinguished here, as in South Carolina, as the Spruce Pine. (*Chapman*).

We introduce this species to the notice of our readers on account of its being a native, believing that our own trees should receive our especial attention, if in the least deserving. This species may be rather tender for a northern latitude, but we confess our ignorance on the subject, never having had an opportunity of examining or testing it. The above description is taken from the reliable work by Dr. Chapman, entitled "*Flora of the Southern States*," on the authority of which we have placed it here.

A number of the Southern Coniferæ having been successfully grown in the Middle States, such as the *Torreya taxifolia*, *Taxodium distichum*, *Pinus australis*, etc., we can perceive no cause why this fine tree should not prove equally available.

6. *P. Halepensis*, Mill. — ALEPPO PINE. — Syn. *P. hierosolymitana*, *Du Hamel*. — Leaves, 2 or 3 inches long, seldom in threes, slender, dark green in color. Cones, from $2\frac{1}{2}$ to 3 inches in length, invariably turned downwards, long peduncled, and producing medium-sized seeds, with long wings. Cotyledons, 7. Branches, long and naked. Buds, from $\frac{1}{8}$ to $\frac{1}{4}$ inch long, roundish, imbricated, and destitute of resin.

This species, notwithstanding its resemblance to the *P. Brutia*, is vastly inferior to it, especially in this latitude. It is found in several of the countries bordering on the Mediterranean, especially in the south of Spain, France, Greece, etc. It forms a small tree, scarcely ever exceeding 25 feet in height.

Our experience with it has not been so satisfactory as we could have wished; some seasons standing without protection, and in others being entirely killed.

Its healthfulness depends much upon the nature of the soil, as it is extremely impatient of a cold, damp soil, and on such almost absolutely refuses to thrive; whilst on a more congenial, light, well-drained border, which is also somewhat protected from the cold north winds, it may succeed.

The specimen in the Evans' Arboretum, at Radnor, Delaware Co., Pa., appears to be pretty well acclimated, and although it is in a very sheltered situation, has the appearance of being somewhat out of its latitude. Loudon says: "*P. Halepensis* is the most tender of European Pines, not even excepting *P. Pinea*;" and afterward adds: "In Britain, *P. Halepensis* can only be considered as ornamental, and, when planted singly on a lawn, it

forms one of the handsomest species of the genus. According to Bosc, it is the most elegant of European Pines."

The foliage, we think, is the only redeeming feature of the tree, being of a beautiful, light green color; but unfortunately, this is shed so copiously as to impart a naked appearance, which has anything but an ornamental effect. A variety,

P. Malepensis Pityusa, *Stevens*, which has been honored by eight or ten synonyms, is also cultivated in Europe, and is described as being very distinct from the type in the size of the leaves and the cones, as well as in forming a much larger sized tree.

This variety has been frequently sent out by foreign nurserymen as *P. maritima*, a name that is apparently only used when a plant is unknown, or as a convenient appellation for the Pine genus at large, for any, and everything that dishonest dealers wish to dispose of, for a reasonable compensation. We have seen so many distinct plants sent out under this name, all of which belonged to old, well-defined species, that *P. maritima* has become, to us, a synonym of doubt and uncertainty. There is no species by that name in the Coniferæ.

Var. *minor*, *Loudon*, and var. *genuensis*, *Loudon*, are placed as synonyms of the species by Gordon; and the var. *maritima*, *Loudon*, or *P. maritima*, *Lambert*, is considered as synonymous with the var. *Pityusa*, by the same author.

7. P. inops, *Aiton*.—JERSEY OR SCRUB PINE.—Leaves, 2 to 3 inches long, short, rigid, seldom in threes, with a short sheath. Cones, solitary, oblong-ovoid, 2 or 3 inches in length, frequently curved; peduncle, short. Scales, armed with a straight, rigid spine. Branches, spreading and very flexible, with a rough, dark bark. Seeds, small, and winged.

This common native Pine is found very abundantly in many of the interior States of this country, and especially

where the soil is of a poor, sandy character; in such situations it grows from 15 to 30 feet high. In the barren sections of New Jersey, particularly, this species covers large tracts of waste lands, which are known as the Pine barrens.

Some of the specimens even in these localities are quite handsome, being remarkable for the pale yellowish twigs and leaves, and in many instances forming fine sized trees of regular conical shape, although the large majority of them are but small, stunted shrubs, and far from ornamental.

The appearance of this tree is peculiar and striking; the straggling branches are covered with dark, rough bark; the young shoots, beautifully tinged with violet; and the whole plant is almost covered with exuding resin, which emits a pleasant fragrance or balsamic odor. In some parts of Kentucky tar is obtained from this tree, but for other purposes the wood is of little value.

We cannot recommend it for ornamental planting, but in a large collection, one or two well-grown specimens would not be amiss, it being greatly improved by generous cultivation. A noted European writer has said that, "as in Europe, almost all the American Pines can only be considered in the light of ornamental trees, this species, as such, well deserves a place in collections, from the singularity of its form, its delightful fragrance, and its hardness." We are afraid our cultivators are not sufficiently interested in arboriculture, however, to appreciate these eulogistic remarks.

8. P. Laricio, Poiret. — **CORSICAN PINE.** — Leaves, from 4 to 6 inches long, slender, very wavy, with short sheaths. Cones, 2 to 3 inches or more in length, conical-oblong, recurved at the apex, tawny brown in color. Scales, with a scarcely perceptible prickle. Branches, in regular whorls, spreading, and very resinous. Buds, $\frac{3}{4}$ to

1 inch long, ovate, ending in a long narrow point. Seeds, rather large. Cotyledons, 6 to 8.

A fine, hardy tree, from the south of Europe, in the Island of Corsica, etc. Prof. Tenore mentions vast forests composed of this species on the Mountains of Sila, in Calabria. It mostly attains a height varying with the situation, from 80 to 100 feet; and Loudon states: "In the Island of Corsica, it is said there are trees of this species, from 140 to 150 feet in height." On Mt. Etna, it forms forests at an elevation from 4000 to 6000 feet.

This species, according to Loudon, is a more rapid grower than even *P. sylvestris*, but it is quite a short lived tree, the duration being in Corsica but from 70 to 80 years.

From the many instances of its rapid growth given in Loudon's Arboretum, we make the following extracts:— "The rate of growth in the climate of London is from 2 feet to 3 feet in a year. A tree in the Horticultural Society's Garden, having been 12 years planted, was, in 1834, 20 feet high, and is now, 1837, 25 feet high. A shoot of the year 1829, with part of 1828, cut from a tree 5 years old, on M. Vilmorin's estate, at Barras, and sent to Mr. Lawson's Museum, measured 3 feet in length and $3\frac{1}{2}$ inches in circumference at the thickest end. In Loddiges' Arboretum, this species and its varieties had attained in 1837 about from 20 to 30 feet, whilst the *P. sylvestris* and its varieties had not exceeded 12 feet. In France, according to Thouin, *P. Laricio* grows two-thirds faster than the Scotch Pine, placed in a similar soil and situation."

For lawn-planting, the Corsican Pine is one of the most beautiful and available trees that we have, and is almost invariably an attractive object in a collection. As it is a native of warm climates, many persons suppose it will prove too tender for this section, but so far as we have been able to ascertain, it has given entire satisfaction. The long, wavy leaves are of a bright green color, and the perfect shape of the tree has always produced a favor-

able impression with us, and we wish it were more extensively known. The wood is quite valuable for lumber, being long-grained, white, easily worked, and according to some authorities very durable.

Var. caramanica, *Loudon*.—Syn. *P. caramanica*, *Bosc*; *P. caramaniensis*, *Bon Jard*, etc.—According to Loudon, this variety “has a much rounder and more bushy head, with straight or nearly straight leaves, slender branches, reddish-colored bark, which is wholly or in part covered with white resin. The scales of the cones, which are larger than those of *P. Laricio Corsicana*, are tipped with a harder and more horny point.”

Our own specimen, although quite small, is nevertheless distinct from the species.

Var. Calabrica, *Delamarre*.—From the mountains of Sila, in Calabria, where it forms a fine-sized tree, with the branches densely clothed with leaves that are longer than those of the common form. It is quite hardy here, and will doubtless prove desirable and distinct.

Var. contorta, mentioned in Gordon's *Pinetum*, we have not seen. It is described by that author as “having its lateral branches contorted or twisted round in different directions.”

Var. pygmæa, *Rauch*.—Is a very curious little dwarf variety, that is quite pretty for ornamental shrubbery. The branches almost trail along the ground, and bear short, rigid, curled leaves.

There are other varieties of this species that vary so little from the original as to be unworthy of perpetuation, excepting in the collection of the enthusiast; and even in these, should the labels become accidentally lost, the owner would be at loss to identify the varieties, and probably soon be convinced that he had simply duplicates of the true species.

9. *P. mitis*, Michaux.—SHORT-LEAVED YELLOW PINE.—Syn. *P. variabilis*, *Pursh*.—Leaves, from 3 to 5 inches long, with long sheaths, slender, channelled, and dark green color. Cones, oval or conical-oblong, nearly 2 inches in length, usually solitary, light brown color, with a short incurved spine on each scale; peduncle, short and stout. Seeds, quite small, with reddish wings.

This valuable native tree is found in various sections of our country from New England to the Gulf of Mexico. In New Jersey, especially, it is quite common and may be frequently seen in large numbers with *P. inops*. In the generality of cases it prefers a poor, sandy soil, although occasionally flourishing in fertile places. On a moderately rich, well-drained surface, it forms a beautiful specimen, not unlike in appearance to many of the rare Mexican species; and in fact, with careful cultivation, and sufficient space to develop its peculiar natural beauty, the *P. mitis* will compare very favorably with the majority of these much-extolled and tender strangers.

It varies considerably in height with the quality of the soil and in the situation where it is found; but the medium size is probably about 50 feet. According to Meehan's Hand-book of Ornamental Trees, the Bartram specimen is 90 feet high, and four feet eight inches in circumference; it is growing on a dry, gravelly soil, with a rocky bottom.

The timber furnished by this species is very valuable, although inferior in quality to the Long-leaved Yellow Pine, (*P. australis*), but readily commands a good price not only in our own markets, but in those of European ports, and in consequence has been quite largely exported. The wood is fine-grained, and when devoid of the sap or outer portion, is remarkably durable. The timber is especially valuable in ship building, being excellent for masts, spars, etc., and is consequently in great demand for those purposes. The resinous properties of the species are not of sufficient interest to make it valuable on that

account, although yielding a fair proportion of tar and turpentine.

In a comparison of the opinions of Michaux and Lambert, in regard to the value of the products of this Pine, Loudon gives the following extracts. "Though this species," Michaux observes, "yields turpentine and tar, their extraction demands too much labor, as this Pine is always mingled in the forest with other trees." Lambert, on the contrary, asserts that "the wood has a sponginess and lightness which deprives it of durability, and renders it useless in building, or, indeed, for any purposes of a similar kind; but it is tolerably full of resin, so that the Americans employ it for its tar and pitch."

In an ornamental point of view, it compares very favorably with the majority of our cultivated foreign species. The handsome, conical-shaped head has given it the name of Spruce Pine; in some sections such may possibly be the *P. glabra*, of Walter. The peculiar richness in the coloring of the leaves, softly merging from a bright bluish green to the darkest hue, in the alternate changes of light and shade, is really charming.

The leaves are very fine, slender, and flexible, and impart a peculiar beauty to the tree, which is not met with in any other Pine that is a native of the Northern or Middle States, excepting, perhaps, a chance specimen of *P. rigida*. On this account, a recent writer in recommending it for cultivation, very appropriately compared it to the Austrian Pine, and says: "so far from being naturally a *scraggy* tree, it thickens in more naturally than any Pine I know."

A peculiarity in this species is, that when growing very luxuriantly in rather rich soils, the leaves will often be found three in a sheath, thus giving rise to the synonym of Pursh, *P. variabilis*, as well as the *P. intermedia*, of Fischer, being deemed intermediate, or as a connecting link between the *Binæ* and *Ternatæ* sections. Loudon also

appears to have been misinformed in regard to the true species, or, as is very probable, has overlooked this disposition of the leaves to sport into threes; for he says in his description of this species:—

“The *P. variabilis* of Lambert’s *Pinus*, is unquestionably a totally different plant from the *P. mitis*, of Michaux; being without the violet-colored glaucous bloom on the young shoots, having rigid leaves, generally in threes, and a cone with very strong prickles like that of *P. Tæda*, to which species we have referred it.” We have occasionally seen specimens that were entirely devoid of the violet color on the young shoots as above referred to, and in fact, very different from the species in many minor points, but yet grown from the same tree as others that had every peculiarity of *P. mitis* fully developed. *P. mitis* appears more nearly allied to *P. inops* than any other, and young plants of each are extremely difficult to be distinguished.

10. *P. Mugho*, *Bauhin*.—MUGHO PINE.—Syn. *P. Mughus*, *Loudon*.—*P. sylvestris* *Mugho*, *Bauhin*.—Leaves, nearly 2 inches long, rigid, twisted, dark green color. Cones, conical, shorter than the leaves, sessile, very resinous, generally in pairs, with the scales ending in a pyramidal, quadrangular recurved spine. Sterile aments, almost sessile, and the anthers surmounted by an oval, membranaceous crest. Branches, very numerous and ascending, thickly covered with leaves and a light colored bark.

This dwarfish tree, or shrub, has been the subject of many mistakes, not only in nomenclature, but by vendors distributing all kinds of stunted Pines under this name. But the great majority of mistakes have occurred by confounding the true species with its var. *rostrata*, under the common name or synonym of *P. montana*, and also with the *P. pumilio*; they are so very similar in general appearance, that in the absence of the cones, it is a difficult task to distinguish them. We follow Gordon in his classification of the varieties.

The *P. Mugho* forms a small tree about 25 feet in height, but is occasionally only a large shrub. "M. Villars observes that, when it grows on the summits of mountains, it is a mere bush; but that, as it descends to the plains, it becomes a tree." (Loudon.)

It is from the mountains of Central Europe, and is found growing on the Pyrenees and Alps. Although of too small a size to produce valuable timber, the wood is nevertheless very close-grained and durable, and of a bright red color.

In ornamental plantations, we have seen this Pine used to excellent advantage, particularly where a mass of persistent foliage was desired. The dark green color of the leaves, in conjunction with the great density of the whole plant, admirably adapts it to this purpose. It is quite as hardy as our own native species, enduring the greatest degree of cold, and the most severe winds that visit our latitude, with perfect impunity.

Gordon arranges the hitherto numerous varieties of this species, as follows:

Var. rostrata, *Antoine*.—Syn. *P. montana*, *Baumann*; *P. sylvestris uncinata*, *Widdrington*.—This variety is said to be found on the upper zone, or line, of the forest vegetation of the Pyrenees. Capt. Widdrington states that "this Pine is extremely valuable from its hardness, as well as for the resinous quality and great durability of its timber." He also remarks: "As an ornamental tree it will be highly desirable, from the intensely dark green of its foliage, as well as the close and solid mass it forms; and the habit of the tree, where left at liberty, to throw out massive arms trailing on the ground, a quality so unusual in its class."

It forms a small tree about thirty feet high, and produces cones, with the scales greatly elevated, hooked at the points, and larger than those of the species.

Var. rotundata, *Link*.—*P. montana*, *Wahlenberg*.—

Has a more upright growth than the species, with roundish cones, and a straight, distinct leading stem. It is from the Tyrol, where it forms a small tree.

Var. uliginosa, Wimmer.—Syn. *P. Fischeri, Booth*.—"This is the Austrian form of *P. Mugho*, but very much more robust in stature, forming a handsome pyramidal small tree."

Var. nana, Loudon.—KNEE PINE.—Loudon, in his "Arboretum," places this as a variety of *P. pumilio*, and describes it as follows: "The Knee Pine of the Styrian Alps never grows above 3 feet high. A plant has been in the Trinity College Botanic Garden, Dublin, since 1817, and, in twenty years, it has not attained a greater height than an ordinary-sized man's knee."

11. *P. muricata, D. Don.*—BISHOP'S PINE.—Syn. *P. Murrayana, Balfour*.—*P. Edgariana, Hartweg*.—Leaves, from 3 to 4 inches long, from a medium sized sheath, rigid, stout, bright green color. Cones, 3 inches long, ovate, in clusters, crowded, with thick, wedge-shaped scales, that are mucronated, with an elevated umbilicus. Branches, irregularly spreading, with small acute buds. Seeds, small, dark brown.

This curious Pine is a native of Upper California, and according to Nuttall, was discovered by Dr. Coulter, at San Luis Obispo, in latitude 35°, and at an elevation of 3000 feet above the level of the sea, distant about ten miles. The height is generally about 30 or 40 feet, and it grows very straight, with a somewhat stunted appearance. The strangest peculiarity about this species is in the "squarrose spreading of the basilar scales, which present long and sharp points in all directions."

We are not aware of this tree having been tested in this country, although it has proven hardy in England; but we cannot see anything to prevent it from succeeding as satisfactorily with us, as many Conifers from the same locality flourish here with perfect hardiness. It is true,

the *P. insignis*, a native of the same section, and often found growing in close proximity to this species, will not succeed here under the most careful treatment; and the Bishop's Pine may unfortunately be of the same temperament, although we sincerely hope to the contrary.

Hartweg found it growing on the western declivity of the mountains near Monterey, and within two miles of the sea-shore; and afterward at a considerable distance to the south of the same place, on the ascent to the Mission of La Purissima, where the trees were of rather small size.

Jeffrey met with it on the Siskiyou Mountains, at an elevation of 7500 feet, near the summit of the mountain, growing in damp soil. Of the value of the wood, we have no account.

12. *P. Pallasiana*, Lambert.—PALLAS' PINE, TARTARIAN PINE, TAURIAN PINE.—Syn. *P. Laricio* Pallasi-ana, *Loudon*.—*P. Taurica*, *Hort*.—*P. maritima*, *Pallas*, etc.—Leaves, from 4 to 8 inches in length, from a short sheath, erect, rigid, acute, channelled, light shining green color. Cones, 4 to 5 inches long, oblong, often curved, sessile, solitary or in small clusters; the scales resembling those of *P. Laricio*, but larger and terminating in a small prickle. Seeds, medium size, obovate; with broad, slender, membranaceous wings.

“*P. Pallasiana* is confined to the central regions of the Crimea, forming considerable forests on the western declivity of the chain of lofty mountains which extends along the coast of the Black Sea. It was first introduced into England by Messrs. Lee & Kennedy, of the Hammersmith Nursery, who raised a number of plants from seeds sent to them by Prof. Pallas, from the Crimea, about 1790, and it was sold by them as *P. Tartarica*.” (*Loudon*.)

Plants raised from the above seeds were set out at Boyton, and are now from 60 to 70 feet in height. Others planted at White Knights by the Duke of Marlborough, are from 50 to 60 feet in height.

"As an ornamental tree," says Loudon, "*P. Pallasiana* deserves a place in every collection;" and Lambert observes: "Of all pines, this is the best adapted for thin chalky soils, and maritime situations." We have had it in cultivation for several years, and, for its distinct habit of growth and great hardiness, have been induced to recommend it; and should the adult trees prove as satisfactory as the young plants promise, it will probably be one of our finest ornamental pines."

Loudon, who, evidently, has never seen large plants, labors under a mistake in confounding it with the *P. Laricio*; the two are now considered botanically distinct, and are at least quite unlike in general appearance. In Sargent's edition of Downing's Landscape Gardening, (the editor of which has probably a wrong plant), it is described as "not very distinctive, as it resembles exceedingly our White Pine." With us, it has the same habit of growth that marks the Austrian Pine; and, in fact, so nearly approaches that species in many leading characteristics, as to induce some acute arboriculturists to believe it would prove to be a variety of *P. Austriaca*.

"According to Prof. Pallas, the wood is very knotty and resinous, and very durable, but difficult to form into good planks on account of the number of its knobs."—(*Loudon*.)

13. *P. Pinaster*, Aiton.—CLUSTER PINE.—Syn. *P. Nepalensis*, *Royle*.—*P. maritima*, *Lamarck*.—*P. Latteri*, *Madden*.—*P. Japonica* and *P. St. Helenica*, *Loudon*.—*P. Chinensis*, *Knight*.—*P. Nova Hollandica* and *P. Nova Zealandica*, *Loddiges*, etc.—Leaves, from 6 inches to 1 foot long, from medium sized sheaths, rigid, stout, dark green color. Cones, from 4 to 6 inches long, conical, sessile, clustered, with broad, ash-colored, pyramidal scales, that terminate in a small sharp point. Branches, in whorls, stout, with rather long, imbricated, pointed woolly buds, that are devoid of resin. Seeds, oblong, medium, with large wings. Cotyledons, 7 or 8.

This beautiful species, with all possible care, is exceed-

ingly unsatisfactory, and cannot be depended upon in the Northern and Middle States. It is a native of the Mediterranean coast, and is found in almost every country bordering on that sea, as well as in the north of Africa, and in portions of Asia, although some writers contend it is an introduced plant in these latter places.

The Cluster Pine is generally found growing from fifty to seventy-five feet in height, and forms a remarkably handsome shaped tree. On the sandy plains in the Apennine range of mountains, this tree flourishes with unusual vigor, and in many sections of that region of country, tracts of sandy, waste places have been planted with it, that now yield annually a large quantity of wood for fuel, as well as an inferior article of lumber.

On calcareous soils, however, it has been asserted that this species will not thrive, an idea it would be well to bear in mind before testing its availability. It is a valuable auxiliary to those residing near the sea-shore where many plants refuse to thrive, as the salt breezes in those localities do not affect it in the least.

The vast extent of country in which this pine has been detected, as well as the number of varieties and different forms of growth it assumes, have given rise to a multiplicity of synonyms, which many of our best authorities have added to; but justice to their discrimination demands that the fact of so great a diversity of names, by such observing and intelligent botanists, should be attributed to the species having manifestly different habits and peculiarities in the various countries where it has been found.

Var. *Hamiltonii*, Tenore.—LORD ABERDEEN'S PINE.—Syn. var. *escarenius*, Loudon.—*P. escarena*, Risso, etc.—According to Loudon, "The leaves are of a paler green than those of the species, but they are equally long and strong. The cones are shorter, and more ovate." This is the most distinct and handsome variety of *P. Pinaster*

that we have seen; it was first introduced into Britain by the Earl of Aberdeen, in 1825."

Var. Lemoniana, Loudon.—The same authority says of this variety that it "is also a very distinct variety, but quite the opposite of the last, being a stunted, bulky plant, with zigzag, close, and twiggy branches, and standing apparently in the same relation to *P. Pinaster* that *P. pumilio* does to *P. sylvestris*." He also adds: "There is nothing dwarfish or diseased in its appearance, nor does it exhibit any peculiarities of constitution to which other pines are not subject."

Var. minor, Loudon.—Syn. *P. maritima minor, Du Hamel.*—Is, according to Loudon, a "variety which is chiefly distinguished by the somewhat smaller size of its cones, being from $3\frac{1}{2}$ inches to 4 inches long, and $1\frac{3}{4}$ inches broad, and is said by Bosc to be produced by a colder climate, and to abound on the west coast of France, especially on the barren sands in the neighborhood of Mans, and to be hardier than the species."

Var. foliis variegatis, Loudon.—Syn. var. *variegata, Gordon.*—"Was discovered by Mr. Cree, the founder of the Addlestone Nursery, towards the end of the last century." The young shoots and foliage are rather prettily striped with straw color.

A number of other varieties are also noticed by Loudon; but later authors, among whom is Gordon, class them as synonyms of the species; the above may not prove more hardy than the common form, but are worthy of a trial by all interested in this genus.

14. P. Pinca, Linnæus.—STONE PINE.—Leaves, from 5 to 7 or 8 inches long, with short, lacerated sheaths; stout, of a deep green color. Cones, 5 or 6 inches in length, ovate, obtuse, glossy, light brown in color; with large, woody scales, terminating in a recurved, deciduous, blunt prickle. Seeds, large ($\frac{3}{4}$ inch long), nut-like, edible,

with a broad wing, one inch long. Cotyledons, 9 to 11. (Crest of the anthers jagged. *Smith.*)

We only mention this beautiful species for the purpose of inducing those favored with a milder climate than our own to give it a fair trial.

It will not grow here with the least hope of success, but in its native habitat, the countries of Southern Europe, it forms a splendid tree, and adds vastly to the effect in picturesque landscapes.

In England this pine rarely exceeds 20 or 30 feet in height, but when cultivated in many sections along the Mediterranean, its height varies from 50 to 60 feet. The specimen in the Evans' Arboretum is about 6 feet high, and has managed to survive several winters without artificial protection, but is nevertheless devoid of beauty, owing to the sickly appearance of the foliage.

In noticing the nutritious properties of its seeds, Loudon gives the following instances: "The kernel of the fruit has a taste which approaches to that of the hazel-nut, and, in France and Italy, is much esteemed for the dessert. Sir George Staunton mentions that the kernels of the Stone Pine are also much relished by the Chinese. In Italy they are put into several kinds of ragouts, and they prove excellent in sugar plums instead of almonds. In Provence, they are extensively consumed along with Corinth raisins, the dried currants of the shops. The kernels require to be kept in the cone till they are about to be used, because they become speedily-rancid when taken out and exposed to the air. In the cone they will preserve their vitality, their freshness, and their taste, 5 or 6 years."

Loudon and Gordon mention *Var. fragilis*, *Du Hamel*, with a thin-shelled seed; and *Var. Cretica*, *Loudon*, with very large cones and slender leaves, as somewhat distinct. The latter forms a much larger tree than the species.

There are a number of unimportant synonyms attached to this pine by various authors.

15. *P. pumilio*, *Hænke*.—DWARF PINE, MOUNTAIN PINE.—Syn. *P. sylvestris pumilio*, *Loudon*.—*P. sylvestris montana*, *Aiton*.—*P. Tartarica*, *Miller*.—Leaves, 2 or $2\frac{1}{2}$ inches long, short, stiff, somewhat twisted, thickly distributed over the branches; with long, lacerated, woolly, white sheaths. Cones, from $1\frac{1}{2}$ to 2 inches long, reddish, or dark purplish-brown when young, and dull brown when mature; when young, erect, when mature, pointing outwards. Buds, ovate, blunt, resinous. Scales and seeds resembling those of *P. sylvestris*, but smaller. Cotyledons, 5 to 7. (*Loudon's Arboretum*.)

A dwarf species from the Alps of Middle Europe, from an elevation of 4000 to 7500 feet. It prefers a damp soil; when on dry, sandy bottoms, it never produces its remarkable density of growth, or dark, healthy green color. It will occasionally attain to the height of twenty feet, but in the generality of cases is but a small creeping shrub, with horizontal, trailing, and recurved branches, and forming a dense mass of wood and foliage.

It is chiefly found above the regions of the taller trees, and in such instances is invariably small. Some writers speak rather disparagingly of its merits as an evergreen shrub, and indeed, in this country it has never, until recently, received that encouragement which it justly deserves; but thanks to an increasing taste for horticultural pursuits, it has lately become quite popular.

With generous treatment to allow of a perfect development, it has always been an especial favorite with us, and one which we would not readily dispense with. It is very hardy, withstanding our coldest winters without protection of any kind, and grows rapidly. It may be readily propagated from seeds, which are generally imported and sold by our seedsmen at a comparatively low price.

The wood is very resinous, and is said to produce the Hungarian Balsam.

16. *P. pungens*, *Michaux*.—TABLE-MOUNTAIN PINE.—Leaves, $2\frac{1}{2}$ inches long, from small, smooth sheaths;

rigid, stout, pale green color. Cones, 3 inches long, yellowish-brown, ovate, sessile, clustered in whorls; with thick, woody scales, armed at the apex with stout prickles, which are incurved on the upper scales, and recurved on the lower ones. Branches, rigid and irregular; with cylindrical, obtuse, brownish buds, covered with white resin.

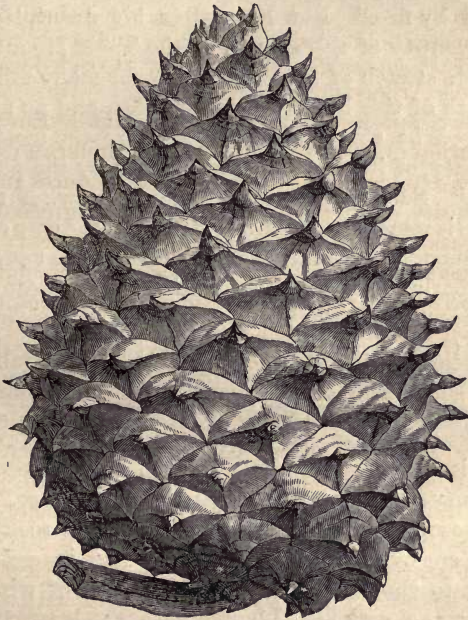


Fig. 13.—CONE OF *PINUS PUNGENS*.

Seeds, rather small and very dark colored. Cotyledons, 6 to 8.

This species, in favorable soils, attains the height of from 40 to 50 feet, and is confined to a somewhat limited habitat. It is found on the "mountains, rarely west of the Blue Ridge, Georgia to North Carolina, and northward." (Chapman.)

In regard to this limitation Michaux, in describing it,

remarks as follows: "Of all the forest trees of America, this species alone is restricted to such narrow limits, and it will probably be among the first to become extinct, as the mountains which produce it are easy of access, are favored with a salubrious air and a fertile soil, and are rapidly peopling; besides which their forests are frequently ravaged by fire." But Nuttall, in his description, says: "The quantity of this species on the Table Mountain, and on a wide stretch of high mountains for many miles north and south of this locality, is very great, and no apprehensions need be entertained, nor is there the most distant probability, of its ever being extirpated by the puny hand of man." Such difference of opinion between these authorities is somewhat remarkable; but in the case of the latter, his superior advantages for examining the trees in their native locality entitle his description to the greater credit. Later investigations have proven that it extends over quite a large tract, forming a dense growth of a peculiar light green color, which is observable for a great distance.

Nuttall says: "On the vast precipices, slopes, impending rocks and chasms of the Linville, a branch of the Catawba, it darkens the whole horizon and presents an imposing mass of intense and monotonous verdure. It generally occupies the summits of the highest rocky ridges, and sweeps over the most dangerous and inaccessible declivities to the margin of precipices, some of which, overhanging the cove of Linville, are at least 1000 feet perpendicular."

The timber is not particularly prized, and the resin not of sufficient value for manufacturing purposes. The outline and general appearance of the tree bears quite a strong resemblance to the Scotch Pine, excepting in the color of the leaves.

A peculiar feature of this pine is the great length of time which the cones remain on the branches, and being generally in whorls, they create an odd effect. Loudon in-

forms us: "At Dropmore there are cones adhering to the trunk and to large branches of more than 20 years growth, giving the tree a very singular appearance, and rendering its trunk easily distinguishable, even at a distance, from those of all others of the Pine tribe." He also says: "In Britain, *P. pungens* can only be considered as an ornamental tree; but, from the singularity of its cones, it well deserves a place in every pinetum." We desire to add that solitary specimens of this pine are occasionally very handsome, and when covered with their curious masses of cones of different ages, the effect is very striking. Moreover, it is a native tree which has been sadly neglected heretofore, and we desire to encourage its dissemination.

17. *P. Pyrenaica*, *La Peyrouse*.—PYRENEAN PINE.
 —Syn. *P. Laricio Pyrenaica*, *Loudon*.—*P. Hispanica*, *Cook*.—*P. penicellus*, *La Peyrouse*, with numerous others.
 —Leaves, from 5 to 7 inches long, from a long sheath, stiff, crowded in tufts at the extremities of the shoots, pale green color. Cones, $2\frac{1}{2}$ inches long, conical-oblong, generally solitary, short peduncled, smooth, light yellow color, and standing horizontally to the branches. Scales, mostly spineless, small. Seeds, small, with a narrow wing.

This beautiful hardy pine, known by some twelve or fourteen synonyms, forms a valuable addition to our collections.

It comes from the forests of France and Spain, often occupying the highest ranges of their mountains; and notwithstanding the great difference in temperature, it has proven entirely reliable in this country, and may eventually be one of our most valuable ornamental trees. It grows from 60 to 80 feet high, is of a regular conical form, quite compact in shape, and distinct in appearance.

Loudon's synonym of this plant, *P. Laricio Pyrenaica*, is a misnomer, the true plant being specifically distinct from *P. Laricio*, and also very unlike *P. Strobis*, as unfortunately described by another author. The species under

notice has more the appearance of *P. Austriaca*, with light colored foliage, and like it, will undoubtedly prove popular. We lately heard a discriminating botanist assert that the Pyrenean Pine formed one of the finest specimens of the genus, and as such he intended to recommend it.

Loudon states that "Capt. Cook, who introduced this species in 1834, found it occupying the highest range of the extensive forests of the Sierra de Segura, in the south of Spain, where it overtops *P. Halepensis*, and in a corresponding situation in the vast forest region of the Sierra de Cuenca, on the river Gabriel, in Upper Aragon, where it forms extensive forests; but La Peyrouse appears to have only found it in the Pyrenees." Capt. Cook, M. Peyrouse, and others, have described this species under different names; hence the great number of synonyms and consequent confusion in regard to its proper position in a scientific classification.

Capt. Cook, in his description, says "it is quite hardy, of quick growth, and will, from its noble appearance, the beauty of its form, and the clear, transparent color of both the bark and foliage, be a vast acquisition to our park scenery. The timber is white and dry, being nearly without turpentine, but the cones exude a most delicious balsamic odor. It is one of the species described in the book of Arab agriculture, written by a Moor of Seville, in 1200, and translated by Banqueri."

18. *P. resinosa*, Aiton.—RED PINE.—Syn. *P. rubra*, Michaux.—*P. Canadensis bifolia*, Du Hamel.—Leaves, 5 to 6 inches in length, semicylindrical, from long sheaths, rigid, straight, elongated, dark green color. Cones, 2 inches long, ovoid-conical, usually in clusters, short peduncled, with pointless scales. Branches, with smoothish, red bark, and long, acute, resinous, buds.

This tree varies in size, being from 50 to 80 feet high, and is found from Pennsylvania northward through Canada, Nova Scotia, etc. The specific name is derived from the

great quantity of resinous matter contained in every portion of the wood, although not so abundantly as in *P. rigida*.

The common name is in allusion to the color of the bark, which is a beautiful bright red; and so distinct is this peculiarity that Michaux, in describing the species in his North American Sylva, thought proper to change the name to *P. rubra*, but, however applicable this name may be, such innovations cannot be allowed. This is one of the trees sent to England by our first botanist, the indefatigable and enthusiastic Bartram; although it was grown in Britain by Hugh, Duke of Northumberland, in 1756. According to Loudon, "about the end of the last century, Messrs. Loddiges raised nearly 100 plants of *P. resinosa*, from seeds received from Bartram, of Philadelphia, and nearly the whole of these were planted by the then Marquis of Blandford, (the present Duke of Marlborough) at White Knights, where a number of them still exist."

The Red Pine delights in a dry, sandy soil, and in such forms a distinctive and not inelegant tree. A somewhat remarkable feature connected with its growth consists in the leaves being borne in dense bunches on the ends of the branches. This unusual form is not confined entirely to this species, but is also observed in the *P. australis*, and probably a few others. The leaves are quite handsome, being rather long and of a rich, dark green color, which, contrasting with the reddish hue of the bark, produces a pleasing effect. Although this pine is not of sufficient utility for a specimen tree in small ornamental plantations, it must not be altogether neglected, as the striking peculiarities mentioned above, combined with extreme hardiness, strong healthy growth, and adaptation to almost all soils suitable for Conifers, fully entitle it to a place in large collections.

In the various uses to which the Pine family are applied, this species certainly deserves to rank high in our estima-

tion. The resin that abounds so plentifully throughout its structure, as well as the value of the timber, should be sufficient inducements for its cultivation. Michaux very justly advances the claims of this tree, and urges on European cultivators the advantages to be derived from such plantations. Loudon says: "As an ornamental tree, this species is well deserving of cultivation."

19. *P. sylvestris*, Linnæus.—SCOTCH PINE.—(Numerous unimportant synonyms.)—Leaves, from $1\frac{1}{2}$ inches to $2\frac{1}{2}$ inches long, with short, lacerated sheaths, twisted, rigid, light bluish-green. Cones, ovate-conical, from 2 to 3 inches long, grayish-brown color; with a quadrangular, recurved point. Seeds, small, with a long, reddish-colored wing. Crest of the anthers, very small. Cotyledons, 5 to 7.

The Scotch Pine, often erroneously called Scotch Fir, is probably the most useful and numerous, as well as the most familiar, of all the European species. It is, in its native country, what the White Pine is to us; but in point of usefulness in all respects, it is far inferior to the latter. Some European writers, however, think differently, and assert the superior advantages of the Scotch Pine in the strongest terms.

"The first modern record of the tree," says Loudon, "is by Matthioli, who called it *Pinus sylvestris montana*, and *sylvestris* was afterwards adopted by Linnæus." Although the common name would lead us to believe that it is either confined to Scotland, or is remarkably abundant in that country, some writers are in doubt of its being a native there, and are under the impression that it is an introduced plant; but throughout the central countries of Europe, this species forms vast forests,—in many sections clothing the mountain sides with its dark green verdure. Especially in the colder regions, on the Pyrenees, Tyrolian, Swiss, and Vosgian mountains, it is seen in perfection in the most elevated and bleakest situations imaginable. In those countries the Scotch Pine attains a height

of eighty feet and upwards, and is frequently four or five feet in diameter; whilst as it approaches the extreme lim-

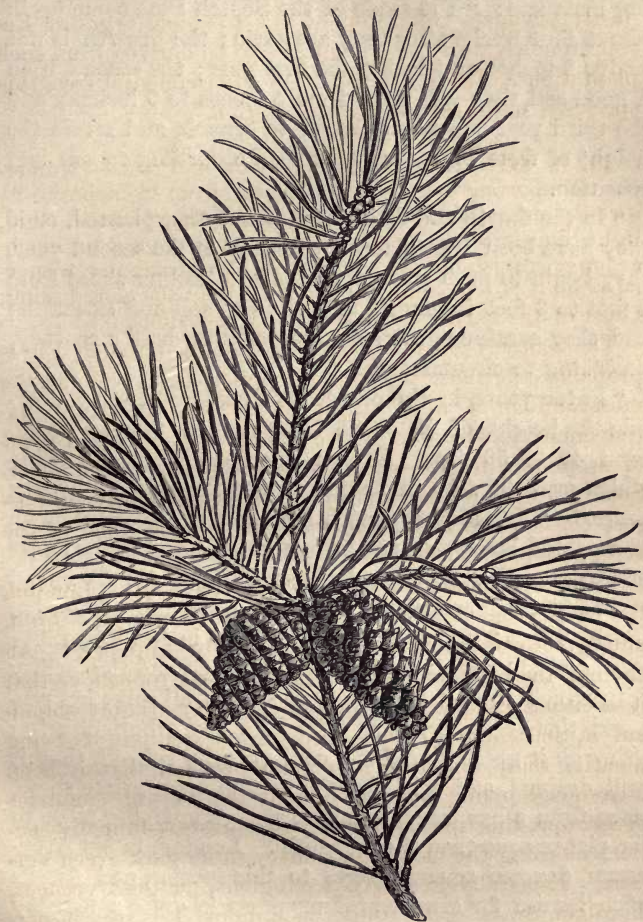


Fig. 14.—*PINUS SYLVESTRIS*.

its of arborescent vegetation, it dwindles down to a mere straggling shrub.

It is one of the fastest growing species of the genus, and in regard to this particular, Loudon gives the following instances: "The seeds of the Scotch Pine come up in about four weeks after they are sown; the growth is not above 3 inches or 4 inches the first year; the second, if on a good soil, they will grow from 4 inches to 6 inches; and the third year the plants begin to branch, and attain the height of from 14 inches to 2 feet, according to soil and situation.

"In the fourth and fifth years, if not transplanted, or if they have been transplanted carefully in the second year, they begin to push strongly, making a leading shoot from 1 foot to 3 feet in length, according to soil and situation; and they continue growing vigorously for half a century, according to circumstances.

"In ten years, in the climate of London, plants will attain the height of 20 or 25 feet; and in twenty years, from 40 to 50 feet. Evelyn mentions a Scotch Pine which grew 60 feet in height in little more than twenty years." "The largest Scotch Pine that was ever cut down in Scotland is supposed to be one which stood in the forest of *Glenmore*, which was called the *Lady of the Glen*, and of which there is a plank in the entrance hall of Gordon Castle, 6 feet 2 inches long, and 5 feet 5 inches broad."

The rapidity of growth, great hardiness, and the facility with which it may be grown on almost all soils, has rendered this tree a great favorite with the arboriculturist; although it greatly prefers a cool gravelly subsoil, that is well drained, and will then, in certain appropriate spots, often form a handsome tree, but always inclining more to the picturesque than the beautiful. Loudon, in his *Arboretum*, devotes several pages to this species, and dwells upon its use for ornamental purposes in quite a lengthy article; but readers in this country must remember that in the large English parks and lawns, a great diversity of situation abounds, and many of the most picturesque are

specially adapted to this tree, but on our smaller lawns it is frequently out of place.

Its value for timber, although inferior to the White Pine and Southern Yellow Pine (*P. australis*), is nevertheless of great importance, and in some sections of France and Belgium, large barren tracts have been planted exclusively with this species, for the purpose of procuring lumber; in these calcareous soils, after the trees have been removed, the land has universally proved more fertile and productive than before, and yielded fair crops of grain. It is the Red and Yellow Deal of England, and is in use there for most purposes, both in naval and civil architecture.

Its terebinthinate properties are also of great importance, as vast quantities of tar are annually exported from Northern Europe to England, etc., where it forms four-fifths of the amount that is consumed.

Var. horizontalis, Don.—This variety is from the Highlands of Scotland, with serrulated and broader leaves than the species, although not margined, and of a peculiar light glaucous color. The branches are remarkably horizontal and drooping. This is known by some as the Red-wooded Scotch Pine, Highland Pine, etc.

Var. uncinata, Don.—Is described by the author as having much lighter colored leaves than the foregoing, and very distinct, “insomuch that they appear of a truly light, glaucous hue, approaching to a silvery tint.” They are also serrulated. The cones are different from those of the species, “being beset with blunt prickles, bent backwards.” Gordon classes this variety as a synonym of the species.

Var. Haguenensis, Loudon.—Is likewise placed as a synonym of the species by Gordon, but Loudon extracts the following description from Lawson’s Manual in regard to it. “The old trees are remarkably tall, straight, free

from branches, except near the summit, with remarkably smooth, reddish-colored bark. The leaves on the young plants are longer, waved and twisted, light green, slightly glaucous, and minutely serrulated; the young terminal buds are of a peculiar reddish color, and generally more or less covered with whitish resin." "The forests of Haguenau," M. Nebel informs us, "extended over upwards of 30,000 acres, but the greater part of the pine trees were cut down during the war."

Var. intermedia, Loudon.—Is from Russia, with "slender young shoots depressed towards the stem, and leaves shorter and less glaucous than those of the species."

Var. Altaica, Ledebour.—A native of the Altaian Mountains, growing about fifty feet high, and introduced into England in 1836, by Dr. Ledebour. A dense, pyramidal tree, with shorter and more rigid leaves than the species.

Var. tortuosa, Don.—Who describes it "as having the leaves shorter than *P. s. vulgaris*, and somewhat curled or twisted. He saw only 3 or 4 trees of it, and thinks it nearly approaches the *P. Banksiana* of Lambert."

Var. monophylla, Hodgins.—This variety has two leaves in a sheath, but united together throughout their length, thus imparting to the tree a very curious appearance. "When the points are taken between the finger and thumb, and the apparently single leaf twisted, it generally separates into two, and sometimes into three leaves."

Var. nana, Hort.—"A very dwarf variety, not growing more than one or two feet high, but spreading widely in a horizontal direction, and having very stunted branches and leaves."—(Gordon.)

Var. variegata, Hort.—"This only differs from the ordinary form in the mixture of its pale straw-colored, with the usual glaucous or bluish-green leaves, being produced on both old and young wood."—(Gordon.)

Var. latifolia, Gordon.—With several synonyms, is

from the Caucasian Mountains, and, according to Gordon, the leaves are much broader, more glaucous, and longer than any other variety of *P. sylvestris*. It is also very robust, and grows to a great size.

Var. argentea, Stevens.—Is the Silvery Scotch Fir, with the cones and leaves a beautiful, silvery, glaucous color: a variety from the region of the Black Sea, where it attains a large size. We believe this has not yet been introduced into this country.

There are other varieties mentioned by Loudon and others, that differ so little from the species as to be now unrecognized; such as var. *Rigensis*, var. *Genevensis*, etc.



SECT. II.—**TERNATÆ.**—THREE LEAVES IN A SHEATH.

20. P. australis, Michaux.—LONG-LEAVED OR SOUTHERN YELLOW PINE.—Syn. *P. palustris, Linnæus.*—Leaves, 10 to 15 inches long; from a long, lacerated, light colored sheath; bright green color, and crowded in dense clusters at the ends of the branches. Cones, from 6 to 10 inches long, mostly cylindrical, of a beautiful brown color, with thick scales, armed with very small recurved prickles. Seeds, large, oval, with a long wing.

With the single exception of the White Pine, (*P. Strobus*,) this species is perhaps the most valuable of the genus, and along our southern sea-board States, particularly in Georgia and Florida, it is to be found in immense numbers, covering large tracts of sandy, barren soil, to the almost total exclusion in many places of all other plants. The size of the trees varies greatly according to soil and situation. Along the roadsides and on sterile spots, they are poor, stunted plants but a few feet in height; but as the soil becomes more congenial they assume their proper proportions, averaging probably 75

feet in height, and single specimens frequently attain a much greater size.

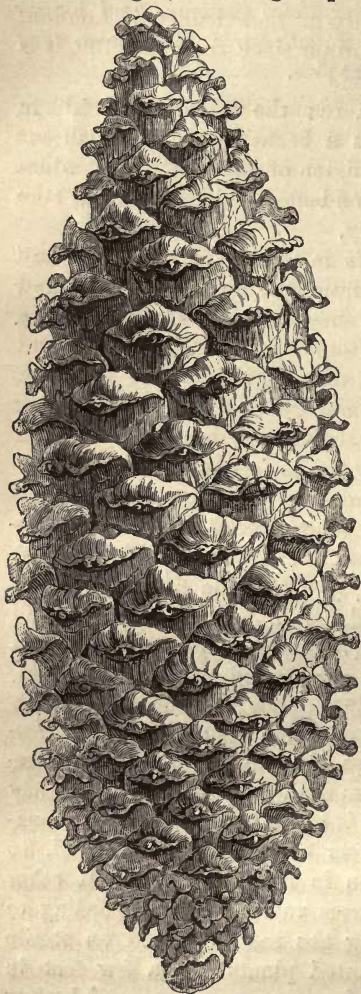


Fig. 15.—PINUS AUSTRALIS.

For ornamental purposes, this pine is well adapted to those sections where it will survive the inclemencies of our winters. The sudden changes, owing to the warm days and bright sun during winter, followed suddenly by the mercury sinking almost to zero, acting on the imperfectly ripened wood, in many cases fatally injure the great majority of southern plants. With us it has stood out for several years, without any protection excepting a slight covering of pine branches during the winter, sufficient to afford it a partial shade. A beautiful specimen grew for several years on the grounds of the late Wm. Reid, at Elizabethtown, N. J., and as it was planted in the centre of a group of evergreens, it thrived uninjured for a number of years.

The late owner assured the author that in such sheltered situations it might be

depended on in the Middle States. We have understood that it is not entirely hardy in the vicinity of London, and although known in Europe since the year 1730, it is not yet common in collections.

The peculiar growth and remarkably beautiful foliage of this species certainly entitle it to the regard of all our cultivators, and with a small amount of care and attention for a few years, we feel confident it will fully repay the trouble expended upon it.

The lumber of *P. australis* is as valuable as that of any other pine, but in some situations the wood is so charged with resin as to become in a measure almost valueless. In a comparison between the timber of the White Pine and Long-leaved Yellow Pine, that of the former is softer, more free from turpentine, and generally of a larger size; whilst, on the other hand, the strong, durable planks and boards manufactured from the latter are unexcelled.

In ship-building the lumber of this pine plays a very important part, and indeed is considered by some to be superior to oak for this purpose. The Carolina floor-boards, so universally preferred in all our large cities, are manufactured from this species, and in many portions of the South the dwellings are constructed exclusively from this lumber, which also forms the fencing material that encloses the fields. As fuel, it is poor, burning badly, with a dense, black smoke, and creating but little heat.

The chief value of this species consists in its products, which, in value, are not equalled by those of any other of the family. North Carolina, for a number of years, derived a large revenue from the manufacture of the various products of this pine, as it not only supplied the demand of our own country for turpentine, rosin, tar, and pitch, but immense quantities of these were exported to European and other ports. The tar being extracted from the dead wood, no part of the tree in any stage is allowed to be wasted, and the accumulation of sap or resin,

as the wood advances towards decomposition, is greatly increased.

The old Linnæan name of *P. palustris*, which was altogether inappropriate to the plant, was changed by Michaux to that which it now bears; and, however we may deprecate the alteration and change of names, we have to confess that, in the present instance, it is justifiable.

Var. excelsa, Loudon.—Syn. *P. palustris excelsa, Booth.*—Is unknown in this country, but, according to English and German writers, it is more hardy, much larger, and has longer leaves than the species. It is also reported to have been found on the north-west coast of America, which latter assertion is, however, very doubtful.

21. P. Fremontiana, Endlicher.—FREMONT'S PINE, NUT PINE.—Syn. *P. monophyllus, Torrey.*—Leaves, from $1\frac{1}{2}$ to 3 inches long, with short sheaths, rigid, curved, sharply mucronate, and of a pale bluish-green color. Cones, $2\frac{1}{2}$ inches long, light brown color and glossy, with thick, recurved scales, entirely destitute of spines. Seeds, quite large, wingless, and edible.

A very distinct species from California, where it was discovered by Col. Fremont, and named in his honor by Prof. Endlicher. It was first called *P. monophyllus*, by Dr. Torrey, who was under the impression that its leaves were solitary. Subsequent investigation, however, decided its true character and the present name was established.

It was first found on the Sierra Nevada, extending along the sides and summits of the mountains for a distance of 300 miles, and was afterwards detected by Jeffrey on Mt. Jefferson, in the Cascade range, at an elevation of 6,500 feet. Fremont mentions that the mercury frequently sank two degrees below zero at night in the above locality, and the snow was four feet in depth. We cannot, at the present time, assert its hardiness, as our specimen is yet quite small, but from the character of the climate of which it is a native we may safely recommend it for trial.

It forms a small tree, probably not exceeding twenty feet in height, but well furnished with side branches and with a peculiar, glaucous, bluish-green foliage, which produces a beautiful effect. The seeds, like many others of our western species of pines, are edible and very nutritious, with shells so thin that they may readily be broken with the fingers. They constitute a large part of the subsistence of the Indians that inhabit those regions, and are gathered by them and stored away for winter use.

Dr. Engelmann says of this plant in a recent article, that "it has single leaves, and not connate, as Endlicher would have it." This is one of those perplexing misunderstandings that will occasionally happen among authors. Our own specimen was grown by the late John Evans, a botanist of no ordinary talent, who procured the seed, if we mistake not, from its native locality. However, it retains all of the specific distinctions as described by Endlicher, having three leaves in a sheath and being only very rarely monophyllous on the young shoots. This monophyllous state is not unfrequently met with in other species, and its frequent occurrence in this particular one is doubtless the cause of the misunderstanding.

The *P. Fremontiana* is one of the very slow growing species that require a number of years to arrive at maturity, and consequently may not, on this account, prove so popular as some others.

This edible, or nut-pine section, is of so much interest, that we make the following extract from Dr. Engelmann's article. "This very natural little group is characterized by the small, almost globose cones, the scales bearing large pyramidal apophyses and large edible seeds, the wings of which remain attached to the scale, which, I suspect, is the case in all 'wingless' seeds of pines; in *P. Pinea*, however, the wing is very distinct, and detaches itself clearly from the scale, and at the same time also from the seed itself, which is likewise the case in the closely allied, though 5-leaved Cal-

ifornian *P. Torreyana*, Parry, where the wing, besides, is very thick and of a corky substance. The great variability in the number of leaves in the nut-pines proves that sectional characters taken from them are without value."

22. *P. Gerardiana*, Wallich—GERARD'S PINE.—Syn. *P. Neosa*, Gowan.—Leaves, from $3\frac{1}{2}$ to 5 inches long; from a short, deciduous, scaly sheath; rigid, crowded, glaucous-green color. Cones, 8 inches long, and 5 inches broad, ovate, resinous; with broad, thick, corky, recurved scales, terminating in a stout spine. Seeds, large, cylindrical, pointed, dark brown color, almost wingless, and edible.

This beautiful tree was discovered by Capt. P. Gerard, in whose honor it was named by Dr. Wallich. It is a native of the Himalayas, and is found "on the northern side of the Snowy range of mountains in Kunawur, beyond the influence of the periodical rains, where it grows in very dry rocky ground. It is also found to the north of Cashmere, and on the Astor Mountains, in Little Tibet." Capt. Gerard mentions its highest limits on the inner Himalayas to be from 10,000 to 12,000 feet. Its height is about 50 feet, and in congenial soil, with proper space to develop its peculiar beauty, it becomes a regular, dense, conical tree. The seeds, like those of the foregoing species, are large and nut-like, very abundant, and highly prized by the inhabitants. The Arabs and Persians have bestowed the name of "Sonoubar Sukkar," or the "Sweet Pine-nut," upon it, owing to this property.

Although it is very distinct from the *P. longifolia* in many and very essential particulars, it was nevertheless frequently confounded with the latter species by early writers. The cones of the two resemble each other very closely, and on this account the confusion evidently arose in the first instance, as many of the first plants raised in England for *P. Gerardiana* have since proven to be *P. longifolia*.

Its hardiness is yet uncertain, although we are favorably impressed with the experiments that have fallen under our notice. With us it proves successful, but we generally place a slight protection of evergreen boughs around the plant to shade it from the sun in winter. The color of its foliage is that of a beautiful glaucous green, and contrasts agreeably with the darker hues in a group of pines. The large cones, with their peculiar thick, recurved scales and edible seeds, are also very interesting. This species is quite remarkable for the copiousness of its resin.

23. *P. Jeffreyi*, Hort.—JEFFREY'S PINE.—Leaves, 8 inches long, from long, lacerated, persistent sheaths; acute, recurved, stout, dark green color. Cones, 8 inches long, ovate-conical, clustered, with broad, projecting scales, armed with very large, incurved spines; seeds, quite large, and handsomely striped.

This beautiful new species is from Northern California, where, according to Jeffrey, it inhabits poor, sandy soils, and forms a majestic tree 150 feet in height.

It resembles the *P. ponderosa* somewhat in general appearance, but has much more slender leaves. As regards the hardiness of this new candidate for popular favor, we are pleased to be able to place it amongst those that promise well. We have exposed it to the severity of several winters, all of which it came through safely. But it is proper to state that a more thorough trial is necessary before it can be considered as perfectly reliable.

The branches of this pine are slender, very spreading, and of a pale, reddish-brown color; the buds are small, and quite resinous. Like the most of our Californian species, it has large cones, which render it conspicuous, being furnished with large, pyramidal, hooked scales.

24. *P. macrocarpa*, Lindley.—COULTER'S PINE, GREAT-HOOKED PINE.—Syn. *P. Coulteri*, Don; *P. Sabiniana Coulteri*, Loudon.—Leaves, 9 inches long, with long

sheaths, very broad, rigid, incurved, acute, compressed, and light glaucous green color. Cones, "largest of the family," (*Nuttall*); "1 foot and more in length, 6 inches in diameter near the middle, and weighing about 4 lbs.," (*Lambert*); conical-oblong, solitary, shining chestnut-brown color; with the large, indurated, wedge-shaped scales terminating in a long, recurved and compressed spine, 3 or 4 inches in length. Seeds, large, flat, edible, dark brown color, with long, stiff, light brown wings.

This splendid Conifer has been so recently introduced into cultivation that we feel a slight hesitancy in extolling its merits as highly as they doubtless deserve; but, being a native of our own country, and also possessing so many excellences to recommend it to the notice of planters, we may be excused for our great partiality to it.

According to *Nuttall*: "It was discovered by Dr. Coulter on the mountains of Santa Lucia, near the Mission of San Antonio, in the 36° of latitude within sight of the sea, and at an elevation of between 3000 and 4000 feet above its level. It was accompanied by the *P. Lambertiana*."

Gordon, in describing this pine, remarks: "It is also plentiful in other parts of California, particularly on the 'Cerusta,' an ascent from San Luis Obispo, on the brow of the mountain." It forms a large tree, from 80 to 100 feet in height, with large, spreading branches, and a trunk 3 or 4 feet in diameter.

The magnificent, long, glaucous green leaves of this pine cannot be excelled in beauty; and the immense size, as well as the curious structure of the cone, fully entitles it to consideration. This latter feature is thus noticed by *Nuttall*: "Travellers compare them for magnitude to sugar loaves, which they resemble in form, suspended, as it were, from forest trees." The large, nut-like seeds contained in these cones are said to be very excellent and nutritious, although not equal in size to those of *P. Sabiniana*.

We are not prepared at present to speak confidently of its hardness, but, judging from experience and what

we could obtain from other cultivators, think that on suitable, light, well-drained soil and in a favorable situation, this species will eventually succeed in the southern portion of the Middle States, and probably may thrive in in a still lower temperature than we anticipate. That such may be the case we sincerely desire, as the surpassing beauty of our California pines is unexcelled in the world.

Owing to the want of sufficient knowledge in respect to this tree, Loudon, in his *Arboretum*, places it as a synonym of the *P. Sabiniana*; but more recent investigation has proven it essentially distinct, and it has been designated as a separate species.

25. *P. ponderosa*, Douglas.—HEAVY-WOODED PINE.—Syn. *P. Beardsleyi*, *Murray*; *P. Engelmanni*, *Torrey*; *P. Benthamiana*, *Hartweg*.—Leaves, from 9 inches to 1 foot in length, short sheaths, broad, crowded, flexible, tortuous, and deep green color. Cones, $3\frac{1}{2}$ inches long, ovate, reflexed, clustered, short-peduncled; with the long, flattened scales armed with a small, sharp, recurved prickle. Seeds, rather small, with long, yellowish-brown wings. Buds, cylindrical, long, tapering gradually to an obtuse point, and covered with a light glaucous bloom.

A fine hardy species from our Pacific coast, growing, according to Gordon, “100 feet high and 4 or 5 feet in diameter, with 30 or 40 feet of the stem free from branches;” whilst those observed by Nuttall were “growing in a poor soil, and not more than 12 to 20 feet high.” Dr. Parry found it “common through all the lower valleys and less elevated districts of the mountains, associated with *Abies Douglasii* and *A. Menziesii*; a most valuable timber tree.”

It is very common through some districts in Northwestern America, particularly in portions of Oregon, where Douglas found it growing in large quantities on the banks of the Spokane and Flat-head Rivers, and near the Kettle Falls of the Columbia River. In the Rose River Valley,

in California, it is very abundant, and is there chiefly confined to the low alluvial soils, where it develops its full proportions.

As an ornament we are rather inclined to believe it will not prove so popular as many others of our new Rocky Mountain Pines, owing to the coarse and somewhat open appearance of the tree. Yet, on the other hand, its remarkable vigor, excessive hardiness, and dark green foliage, will certainly weigh in its favor, and may eventually counterbalance all obstacles to its becoming a favorite kind. Nuttall appears to be very sanguine in regard to its future usefulness in cultivated grounds. He says: "The tree has proven quite hardy and of a rapid growth, both in the climate of London and Edinburgh. It has a very elegant appearance even as a young tree, and seems to surpass all others in strength and luxuriance."

Loudon concludes his description of this tree as follows: "*Pinus ponderosa*, which is, perhaps, more hardy than *P. Pinaster*, and is of equally rapid growth, has a noble appearance even when a young tree; and together with *P. Sabiniana* and *P. Coulteri*, equally noble trees, and apparently as hardy and of as rapid growth, well deserves a place in every pinetum."

The timber is excellent and remarkably heavy, and in those sections where it attains a large size, it will prove very valuable on this account.

26. *P. radiata*, D. Don.—RADIATED-SCALED PINE.—Leaves, from $3\frac{1}{2}$ to 4 inches long, from short, smooth sheaths; crowded, slender, twisted, dark green color. Cones, 6 inches long, ovate, solitary, or in small clusters, incurved, pendulous, with thick, truncate, obtuse scales, terminating in a blunt point. Seeds, small, very dark, with long wings. Cotyledons, 7 to 8.

Although our experience with this tree has been so very discouraging, we nevertheless include it in our list for the benefit of those who desire to test its availability. We

have tried it in various situations, with and without protection, but unfortunately it perished in every case; and notwithstanding we have tested it several seasons, we have met with unvarying failure, and are therefore compelled to relinquish our attempt, however well it may succeed in other soils and situations.

It was discovered by Dr. Coulter in Upper California in latitude 36° , near the level of the sea and growing close to the beach, where it attained the height of 100 feet, beautifully furnished with branches close to the ground. The fact that it is a sea side plant may be the reason why our plants do not flourish. Sea air and the peculiar formation of the soil to be found in such localities being necessary to its permanent success, it should be tried by those living in suitable localities.

Were this tree entirely hardy here, it would be, without doubt, one of the most desirable of the Californian pines. The timber is tough and of first quality, which has caused it to be in great demand, especially for boat-building, large quantities being annually used for that purpose.

The branches of this pine are very numerous and slender and covered with smooth, light colored bark; the buds, small and very resinous.

27. *P. rigida*, Miller.—PITCH PINE.—Leaves, from 3 to 5 inches long, from very short sheaths, crowded, rigid, flattened, mostly dark-green color. Cones, ovoid-conical, or ovate-oblong, sessile, from 1 to $3\frac{1}{2}$ inches long, mostly solitary, occasionally in clusters of 3 or 4, very persistent; the scales terminating with a small, recurved, stout prickle. Seeds, small.

This native species, so common to the middle portions of our country, we do not consider one of our finest trees for lawn planting, being frequently devoid of that beauty of outline and compact habit of growth so necessary in an ornamental Conifer. It forms a medium sized tree, from 30 to 70 feet in height, with dark, rugged looking

bark, and generally of rather feeble growth. It inhabits light, sandy soils, or dry, rocky situations, excepting in some sections near the sea-coast, where it is often found growing in low, marshy grounds, and in such the size of the tree is very greatly increased.

Although this species is so frequently found growing in low, swampy grounds, particularly in the "Cedar Swamps" of Maryland and Delaware, it is often seen flourishing in situations that are exactly the opposite. Within sight of where we are writing is a large group of these pines intermingled with the *P. inops*, which are growing on a dry, slaty ridge, with a very slight depth of soil.

The wood is of little value for lumber, owing to the large number of knots throughout its entire length, as well as to the preponderance of sap; but much depends upon the quality of the soil from whence it is taken;—trees growing on light, gravelly, or rocky soils furnishing a heavy, resinous timber, whilst, on the contrary, those on damp, alluvial lands produce a soft and light wood. In any situation, however, it is much inferior to others of our native species. The wood throws out an intense heat in burning, and is sought after for certain purposes. It also furnishes a liberal supply of tar, although not of sufficient value for extensive manufacture.

Var. serotina, Loudon.—POND PINE.—Syn. *P. serotina*, *Michaux*, *Chapman*, &c.—This pine has been reduced by Prof. Gray to a mere form of the *P. rigida*. Loudon also describes it as a variety and Pursh suspected the same, although Gordon, in England, and Chapman, in this country, recognize it as a distinct species.

The only apparent differences in the two are, that the variety produces ovate or roundish cones, generally opposite, and mostly solitary, and has rather longer leaves. We are always pleased to have our authorities consolidate two species, when they appear so nearly allied as the above.

28. *P. Sabiniana*, *Douglas*.—SABINE'S PINE. GREAT PRICKLY-CONED PINE.—Leaves, from 10 to 12 or 14 inches long; from long, light-brown, shining, membranaceous sheaths; serrate, slender, acute, recurved, flexuose, and glaucous-green color. Cones, from 8 to 10 inches long; and 6 inches in diameter; ovate, echinate, in large clusters, recurved, very persistent; with large spathulate or awl-shaped, incurved scales, ending in a strong, sharp point. Seeds, large, oblong, tapering to the base, with a thick, hard, brown integument, and a short, stiff, yellow wing. Cotyledons, from 7 to 12.

This magnificent native Conifer is one of the very finest of the family, and was discovered by the lamented explorer, Douglas, who named it in honor of a former secretary of the London Horticultural Society, Joseph Sabine, Esq. It was first found in the parallel of 40° , on the Cordilleras of California, at a very high elevation, and only 1600 feet below the region of perpetual snow, and was afterwards discovered growing nearer the sea-coast at a lower elevation, but more even temperature, in the parallel of 37° . It is also found at El Toro, a high mountain near Monterey, and, according to Dr. Gairdner, on the Fallatine Hills of the Wahlamet, as well as in many other places in Upper California and Oregon, but almost invariably upon the summits of high elevations on the mountains.

The beautiful, regular form presented by a perfect specimen of this tree is all that we could wish for in that respect; and when to this is added a compact mass of deep green verdure, gracefully extending to the ground, we do not know of anything more desirable. The cones are also not only exceedingly curious, but handsome and useful; producing seeds that are in great esteem among the natives as food, and nearly as pleasant as almonds, excepting that they leave behind a slightly resinous taste.

Nuttall, in his description of this species, says, "The stems of these pines are of a very regular form, and grow straight and tapering to the height of from 40 to 140

feet, and are from 3 to 12 feet in circumference, when standing apart, clothed with branches down to the ground." Other authors state that on the western Cordilleras of New Albion, at a great elevation, they grow from 100 to 150 feet in height, and from 2 to 5 feet in diameter. But all unite in praising its exceeding beauty as a specimen tree. The wood is white, soft, even-grained, and, perhaps, not very durable." This species yields a copious supply of resin when punctured.

29. *P. Tæda*, *Linnaeus*.—LOBLOLLY PINE. OLD-FIELD PINE. FRANKINCENSE PINE.—Leaves, 6 to 10 inches long, from elongated sheaths, rigid, slender, rather obtuse, and light-green color. Cones, 3 to 5 inches long, oblong, solitary, or in pairs, somewhat truncate at the base; the scales terminated with short, sharp, incurved prickles. Seeds small.

This is another of our native pines that is confined to the Atlantic States, and found frequently growing in company with the *P. australis*, although mostly in damp soils, not too heavy. According to Loudon, "it was introduced into England before 1713, by Bishop Compton."

It forms quite a large tree under favorable circumstances, ranging from 50 to 100 feet high, with very thick and deeply furrowed bark.

In the light barren soils of Virginia, it may be frequently met with as a somewhat stunted large shrub. "All the woods in the Southern States," says Pursh, "seem to be seeded with it; for, when any piece of clear land is neglected for a length of time, it is speedily covered with this species; and hence its name among the inhabitants, of Old-field Pine. It is difficult, and in some cases almost impracticable, to recover the lands which have been over-run with young pines of this species, as the ground appears to have lost all fertile properties for any other vegetable than these trees."

Michaux says, "In the same parts of Virginia, this species

exclusively occupies lands that have been exhausted by cultivation; and amid forests of oak, tracts of 100 or 200 acres are not unfrequently seen covered with thriving young pines."

There is a plant of this species in our immediate neighborhood, which is at least 20 feet high, and stands the severity of our winters without any serious injury. In our own grounds, a plant now 7 feet high, and which was raised from seed here, has so far escaped with little detriment to its outline. We cannot, however, recommend it for ornamental purposes, excepting in large collections, as it is much inferior in beauty to our White Pine and others of the genus.

The timber is not valuable, owing to its propensity to warp and decay, but is nevertheless used in large quantities for secondary purposes. Its resinous properties are not equal to those of the *P. australis*, and its wood is less valuable for fuel.

30. *P. tuberculata*, D. Don.—TUBERCULATED-CONED PINE.—Syn. *P. Californica*, *Hartweg*.—Leaves, 4 to 5 inches long, from short smooth sheaths, rigid, flattish, and bright green color. Cones, 4 inches long, oblong-conical, mostly in small clusters, very persistent, sessile, pendulous, and tawny-gray color; scales quadrangular, truncate, with an elevated apex, and armed with a stout, short prickle. Seeds very small.

This species, whose existence was much doubted by Nuttall, is a native of California and was first discovered by Dr. Coulter to the south of Monterey, near the level of the sea, intermixed with *P. radiata*. Hartweg found it on the Santa Cruz Mountains, sixty miles to the north of Monterey, and Jeffrey mentions meeting with it at an elevation of 5000 feet.

It is a rather small tree, seldom attaining a greater height than 30 or 40 feet, with a trunk 8 or 10 inches in diameter, and is likewise of very slow growth, requiring

many years to attain its full size. The specimen in our own collection is so small that we cannot report any very satisfactory experience with it in respect to hardiness, but from the situation where it is mostly found, and from its being so closely allied to *P. insignis* and *P. radiata*, both of which are exceedingly unsatisfactory here, we are inclined to be somewhat skeptical as to its future usefulness with us.

Nuttall says it is nearly allied to *P. patula*, the Long-leaved Mexican Pine of Schiede, which is also tender; we have, therefore, not a very flattering prospect before us in attempting to acclimate it. Timber, very hard, and dark red color.

SEC. III.—**QUINÆ.**—FIVE LEAVES IN A SHEATH.

31. *P. aristata*, Engelmann.—AWNED-CONED PINE.—Leaves from 1 to $1\frac{1}{2}$ inches long, crowded from the axils of ovate, acuminate, brittle, at first light-brown scales, which, persisting longer than the leaves themselves, cover the branches with their rough blackish remains; incurved, entire, abruptly acute, light-green on both sides. Cones, $2\frac{1}{4}$ to $2\frac{1}{2}$ inches long, oval, resinous, dark purplish-brown color; scales, terminating in a slender, incurved mucro. Seeds, small. Cotyledons, 7.

We introduce this new Conifer in this place, on account of its undoubted hardiness and adaptability to the climate of the Middle States. Although of very recent introduction, young plants are now being tested, both in England and this country, and we look forward with great interest to its permanent and successful cultivation.

It was discovered by Dr. C. C. Parry, growing in the alpine regions of Colorado Territory, above the limits of *Pinus flexilis*, *Abies Engelmannii*, and other sub-alpine Conifers; indeed, it first makes its appearance, in ascending

the slopes, where the other pines become mere stunted shrubs.

We make the following extracts from Dr. Engelmann's paper in the Transactions of the St. Louis Academy of Sciences: "On alpine heights, between 9,200 and 11,800 or 12,000 feet high, on Pike's Peak and the high mountains of the Snowy Range, Dr. Parry, 1861 and 1862, Messrs. Hall and Harbour, 1862. Also on the heights of the Coochetopa Pass, nearly south-west of Pike's Peak, (altitude over 10,000 feet,) where Captain Gunnison discovered, in 1853, what seems to be this species without fruit, (see Pacific R. R. Rep., II., p. 130); the leaves which I could compare are those of our plant. Flowers end of June and beginning of July. Flourishing best in the higher elevations, and never descending below 9,000 feet, in its lower ranges not ripening its fruits as well as on the bleak heights; this truly alpine species—in this respect our representative of the European *P. pumilis*—characterizes the highest belt of timber on the peaks of Colorado. On sheltered slopes a tree 40 or 50 feet high and from 1 to 2 feet in diameter, it becomes a straggling bush, prostrate, and almost creeping, on the bleak summits of the high ridges."



Fig. 16.—PINUS ARISTATA.

In allusion to its apparently very slow growth, Doctor Engelmann says: "Its growth, at least in the latter localities, is exceedingly slow, as a stick of scarcely more than one inch in diameter, brought back by Dr. Parry, shows nearly fifty annual rings, some of them $\frac{1}{80}$ of a line, and

none more than $\frac{1}{8}$ of a line wide." The same author also states that the wood is white, tough, not very resinous; and that a tree of two feet thickness, at "the above rate, indicates an age of over 1,000 years; but the annual rings of larger trees growing in favored situations are wider, and, if a specimen sent by Dr. Parry is not mislabelled, sometimes as wide as $\frac{1}{3}$ line, giving the largest trees a probable age of from 500 to 800 years.

"The branches are spreading, very often many of them twisted, stunted, or dead; the larger branches and the stem itself frequently covered with young branches or shoots, which seem to keep life in the old trunk. The bark is thin and scaly, even in older trees not more than 3 or 4 lines thick, of a light grayish-brown color; that of younger branches, smooth, with many large vesicles containing a clear fluid balsam, which remains between the layers of the old bark."

The leaves of this pine are, without doubt, more persistent than those of any known species, as accurate observations have proven that they have remained on the tree for a period of 16 years.

32. P. Cembra, *Linnaeus*.—SWISS STONE PINE.—Leaves, 2 to 3 inches long, from a medium sized deciduous sheath, triangular, slender, straight, crowded, glaucous, dark green color. Cones, 3 inches long, ovate, erect, with obtuse, slightly hooked scales. Seeds, very large, edible, wedge-shaped, wingless, with hard shells. Cotyledons, 11 to 13.

A handsome, hardy species, that was introduced into cultivation about the year 1746, from the highest regions of the Alps, between 4000 and 6000 feet elevation, and forming quite large trees about 50 feet in height. From the Tyrol to Mt. Cenis, in Austria, it is also frequently met with forming vast forests of the darkest and most sombre verdure. Pallas mentions this species as a lofty

tree growing 120 feet in height; but perhaps he may have been mistaken, as his account differs from that of others.

The tree forms a handsome, regular cone, clothed with branches to the ground, very dense in its growth, as hardy as any of our native species, and in a group of pines, the darkness of its foliage contrasts finely with the lighter green of other members of this family. "According to Lambert," says Loudon, "the flowers have a more beautiful appearance than in any other species of pine, being of a bright purple; and the unripe full-grown cones, he says, have a bloom upon them like that of a ripe Orleans Plum."

The slowness of its growth, however, is to be regretted, for were it otherwise, we could without reservation recommend it for extensive cultivation; but, notwithstanding this unpopular obstacle, the Stone Pine is deservedly in favor for creating certain effects in landscape gardening, which are unobtainable with any other species.

Loudon says: "In England, it is a formal, and we do not think it can be considered a handsome tree; it presents to the eye a multiplicity of tufts of leaves, piled up one above another, of the same size, and equidistant, and everywhere of a rather dull green color. The uniformity of shape is nowhere broken, except at the summit, where alone the cones are produced; and hence, as a mass, it may be characterized as formal and monotonous, without being grand."

The same author subsequently remarks: "The summit of the tree, however, and its purple cones, we acknowledge to be truly beautiful. That we may not run the slightest risk of injuring this tree, we may mention that Mr. Lambert, so far from entertaining the same opinion as we do respecting it, looks upon it as *one of the handsomest trees of the whole genus.*"

An excellent quality in the Stone Pine is its adaptability to almost all kinds of soils and situations, and even Loudon is forced to admit this when he remarks: "Though

the Cembran Pine, as we have seen, will grow in the poorest soils and in the most elevated and exposed situations where no other pine or fir will exist, yet it will not grow rapidly except in a free soil, somewhat deep, and in a dry subsoil."

The timber is fine-grained and very soft, thus allowing of its extensive use for carving, and, in some sections of Switzerland, it is in demand for the manufacture of toys of various kinds, especially among the Helvetian shepherds. It also furnishes a liberal supply of fragrant resin.

Var. *Sibirica*, Loudon.—Pallas says this form is not found beyond the Lena, and is a lofty tree. It differs from the species in having shorter and lighter green leaves; also, producing longer cones, with larger scales. It resembles somewhat the Scotch Pine, but has a smoother and grayer bark. It is a native of Eastern Siberia, and has, like the species, large, edible seeds.

Var. *pygmæa*, Fischer.—Syn. var. *pumila*, *Endlicher*, etc., etc.—This is a handsome and desirable little dwarf, seldom exceeding 2 or 3 feet in height, although old specimens are known that are 5 or 6 feet high. It has very short leaves, small, roundish cones, and small seeds. The native habitat of this variety is on rocky eminences and dry, sterile spots, which, in many instances, are almost devoid of other vegetation. Loudon says: "There is a plant at Dropmore which has been twenty years planted, and, in 1837, was not more than *six inches* high, which we presume to be this variety. The same may be said of a tree in Hopetoun Gardens, near Edinburgh, said to be upwards of 100 years old, and which, in 1836, measured only 5 feet 6 inches high."

33. *P. excelsa*, Wallich.—BHOTAN PINE.—Syn. *P. Strobilus excelsa*, *Loudon*, etc.—Leaves, from 5 to 7 inches long; with short, caducous, imbricated, membranaceous sheaths; slender, mucronate, crowded, glaucous green



Fig. 17.—*PINUS EXCELSA*, HALF THE NATURAL SIZE, FROM A SPECIMEN
FRUITED BY A. FIOT, BETLEHEM, PA.

color. Cones, from 6 to 9 inches long, 2 inches in diameter, cylindrical, smooth, pendulous, pedunculate, clustered; with broad, thick, wedge-shaped, coriaceous, closely imbricated scales. Seeds, mostly small, ovate, compressed, with a hard, dark colored testa, and a membranaceous, reticulated, oblong-obtuse wing.

This beautiful pine, owing to an unfortunate habit of blasting, is not so popular at the present time as it deserves to be. The high cultivation given it by most planters has, in the majority of instances, resulted in failure, and consequently the tree is condemned, when the fault lies in the soil, which caused a superabundance of weak, unripened wood. Such is the idea we have formed upon the subject, and in every case that has fallen under our notice an examination into the cause of failure has resulted in establishing this view.

The Bhotan Pine is a native of Nepal and Bhotan; and on the Himalayas, at elevations of from 6000 to 8000 feet, (and occasionally even to 11,500 feet,) it flourishes with remarkable vigor, forming entire forests along the warmer slopes. Perhaps the finest specimens are to be found near the Shatool Pass, and below Shansoo, in Kunawur, where these trees are occasionally found 150 feet in height, generally branched to the ground and forming large, spreading cones.

We consider this species one of the most desirable of the family for parks and pleasure grounds, as its remarkably graceful, drooping habit, (which has given it the name of "Drooping Fir" by some Himalayan travellers,) is peculiarly appropriate for single specimens; and as it is perfectly hardy, withstanding the utmost severity of our winters, it should be included in every collection, however small.

The general appearance of this tree reminds one of a handsome White Pine, and indeed the resemblance becomes more perfect upon a nearer inspection, as they are

very closely allied. But the latter is decidedly inferior in point of beauty, the Bhotan Pine having much longer and more glaucous leaves, as well as a more dense and compact habit of growth. In fact, these two species approach very nearly to each other in a botanical classification, the main point of distinction being, according to Lambert, in the crest of the anthers.

We have occasionally also seen the White Pine blast in the same manner as this species, especially when growing very luxuriantly in a rich, deep soil; but the propensity for vigorous, unripened growth is more marked in *P. excelsa*, and therefore the remarks in Sargent's late edition of Downing's Landscape Gardening, in regard to this characteristic, are worthy of much respect. The idea of that author is precisely similar to that which has been forced upon us by experience. Some attribute the early decay of this tree to the presence of some of the wood-boring insects, but although we have known instances where such was the case, we believe them to be rare.

The great difference in soil and situation has caused a dissimilarity in the growth of this species, so that varieties with shorter or more rigid leaves have been frequently introduced as distinct; but these have all very properly been placed under the species.

The *P. excelsa* furnishes a soft, compact, and white lumber, very similar to the *P. Strobus*, but perhaps not so valuable, owing to the abundance of resin. The turpentine extracted from the wood is very copious, exceedingly fragrant, and useful. It is said to be so pure and limpid that the slightest incision in the tree causes it to flow freely.

34. *P. flexilis*, James.—AMERICAN CEMBRAN PINE.—Leaves, from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, rarely 3 inches long, from lanceolate, deciduous sheaths, rigid, entire, acute, densely crowded. Cones, sub-cylindric, tapering to the end, from 4 to 5 inches long, 2 inches in diameter, short peduncled, semi-pendulous (*Dr. Parry*,) clustered. Scales,

thick, ligneous, obtuse, loose, squarrose, lowest sterile ones recurved, yellowish-brown color. Seeds, rather large, irregularly ovate or obovate, with persistent, sharp, keeled margins, representing minute wings. Cotyledons, 8 or 9.

This species, the identity of which has been questioned

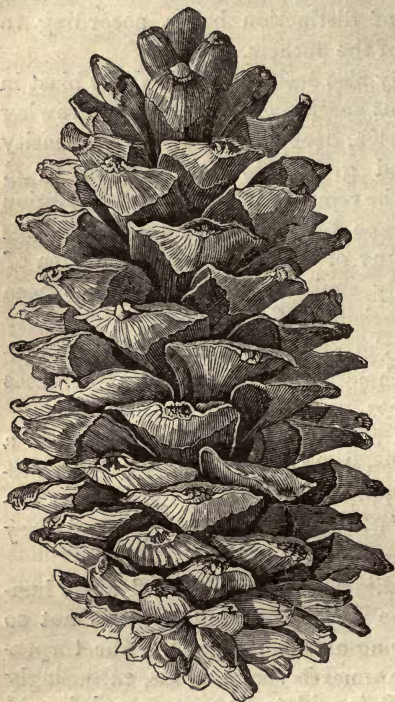


Fig. 18.—*PINUS FLEXILIS*, FROM A ROCKY MOUNTAIN SPECIMEN, COLLECTED BY DOCT. PARRY.

for the last forty years, is now happily assigned the position that its discoverer claimed for it. This question has been satisfactorily solved by the researches of Dr. Parry, who had excellent opportunities of examining specimens, and was enabled to correct a few inaccuracies that occurred in previous descriptions.

It was discovered by Dr. James on the Rocky Mountains, growing mostly on the sub-alpine tracts, and extending almost to the utmost limits of vegetation. Mr. H. Engelmann collected it on the

head waters of the Platte, and it has been noticed by several other explorers. Dr. Parry, in his Ascent of Pike's Peak, remarks that "the vertical range of this species, as observed between latitude 38° and 40° W., is from 7,000 to 11,000 feet above the sea. It rarely occurs in large

bodies of timber, but is mostly of scattered growth, being associated at its lowest range with *Pinus ponderosa* and *Pinus contorta*, and at its upper limits with *Pinus aristata* and *Abies Engelmanni*."

In Dr. Engelmann's account of this tree he gives the following statistics in regard to its size: "*P. flexilis*, the American representative of *P. Cembra* of the old world, is a middle sized tree, usually 30 to 50 feet high, though Fendler, a good authority, saw it near Santa Fé, 60 to 80 feet high; Dr. Bigelow's trees, of the height of 100 to 130 feet, on the San Francisco Mountain, must belong to some other five-leaved species."

The same author remarks: "In Colorado it is a fine tree with tapering trunk and oval outline, branching almost from the base, lower branches horizontal, upper ones ascending; wood, white, hard, annual rings from $\frac{1}{8}$ to $\frac{1}{2}$ line, on an average $\frac{1}{4}$ line wide; trees become in 250 or 300 years about one foot thick."

Dr. Parry states: "In general appearance it very closely resembles our *P. Strobus*, from which it differs mainly in its shorter and stouter entire leaves, more branching mode of growth, as well as in the yellowish-brown cones, with peculiar thickened ligneous scales." In Dr. James' account of this species, he stated the cones were "erect;" but Dr. Parry states they "are inclined to be pendulous."

We make the following extracts from Dr. Parry's description: "The seeds are nearly equal in size to those of the New Mexican Nut Pine (*P. edulis*), of an irregular, oval form, 4 to 5 lines long, and possess similar edible qualities. In addition to other peculiarities of this pine may be noticed its slowness of growth; thus, on a small trunk of $7\frac{3}{4}$ inches in diameter there were 232 annual rings. Its wood is soft, of fine texture, the heart-wood inclining to a yellowish cast. The flexibility of its branches, on which Dr. James founded its specific name,

is partly due to the thickness of the elastic bark of the smaller twigs."

We place great reliance upon many of our new native pines, but on none more than this. Coming from an elevated and exposed region we may look for its future usefulness here.

35. *P. Lambertiana*, Douglas.—LAMBERT'S PINE, GIGANTIC PINE.—Syn. *P. Strobilus Lambertiana*, Loudon.—Leaves from 3 to 4 or 5 inches long, from short deciduous sheaths, rigid, slightly denticulate on the margin, bright green color. Cones, from 12 to 14, and even 16 inches long, 4 inches in diameter, cylindrical, gradually tapering to a point, erect when young, pendulous at maturity, destitute of resin, dark brown color; scales, loosely imbricated, dilated, rounded above, devoid of prickles. Seeds, oval, large, sweet and nutritious; with a large, dark colored wing. Cotyledons, 12 or 13.

This magnificent Conifer was discovered by Douglas, in the year 1825, near the source of the Multnomah River, on our northwestern coast.

The discoverer states: "The trunk of *P. Lambertiana* grows from 150 feet to above 200 feet in height, varying from 20 feet to near 60 feet in circumference. One specimen which had been blown down by the wind and which was certainly not the largest, was of the following dimensions: Its entire length was 215 feet; its circumference, at 3 feet from the ground, was 57 feet 9 inches; and at 134 feet from the ground, 17 feet 5 inches. The trunk is unusually straight, and destitute of branches about two-thirds of its height. The bark is uncommonly smooth for such large timber, of a light brown color on the south, and bleached on the north side."

We take great pleasure in recommending this superb pine to the notice of our arboriculturists, believing it to be one of the finest of the genus that has been fully tested. It stands the utmost rigors of our winters without any

protection, and like the closely allied *P. Strobilus*, is a rapid-growing and graceful tree. When young, these two species show a marked resemblance to each other, but as the plants increase in size the distinction soon becomes apparent.

The timber of the *P. Lambertiana* also closely resembles that of the White Pine in being white, soft, and light; consequently it is easily worked. It produces an abundant supply of resin, which is remarkably clear and pure, and when taken from a partially burned tree, it acquires a very sweet and pleasant taste, and is used by the natives as sugar to sweeten their food. The seeds, being very large and nutritious, are consequently of much value, the natives using them either fresh as gathered from the tree, or roasted and prepared into rough cakes during the winter.

37. *P. monticola*, Douglas. — MOUNTAIN PINE.—Syn. *P. Strobilus monticola*, Loudon.—Leaves, from 3 to 4 inches long, from short, imbricated, very deciduous sheaths; obtuse, smooth, obsolete crenulated on the margin, glaucous-green color. Cones, 7 inches long, $1\frac{3}{4}$ inches broad, cylindrical, smooth, obtuse at the apex, short peduncled, resinous, with loosely imbricated, pointed, spineless scales. Seeds, small, with an ample wing.

The resemblance between this species and the *P. Strobilus* has given the former the common name of "*Short-leaved Weymouth Pine*," which was considered by Nuttall as correct, and mentioned by him in his sequel to the North American Sylva, as a variety of that species. This opinion was also concurred in by Loudon, who described it as a variety of *P. Strobilus*. We think, however, its specific character is sufficiently distinct, and that Douglas was correct in his name. This opinion is also entertained by Gordon and other later writers.

It forms a large-sized tree of 100 feet or upwards in height, with a more compact head than the White Pine,

and much shorter and more glaucous leaves. It is a "native of the high mountains, at the Grand Rapids of the Columbia; and in California, on the rocky banks of the Spokane River." (Loudon.) On Trinity Mountain, in Northern California, at an elevation of 7000 feet, it is found quite plentifully, growing on poor, sandy soil, which it greatly prefers, partaking of the same nature as the other allied species, such as *P. Lambertiana*, *P. excelsa*, *P. Strobilus*, etc.; and, in fact, a rich, damp soil is very unsuitable for this group, as is frequently instanced in their sudden death when in such positions. Situations of this nature should therefore be strictly avoided.

We have been greatly pleased with this species, notwithstanding its resemblance to our old Weymouth Pine,—the leaves being shorter and more glaucous, and the form more compact and dense. Its hardiness is without doubt, and we think it altogether very desirable in a collection.

The timber furnished by this species is similar in many respects to that of the White Pine, but more tough.

38. *P. Strobilus*, *Linnaeus*. — WHITE PINE. WEYMOUTH PINE, (of the Europeans.)—Leaves, 3 to 4 inches long, from very deciduous sheaths; slender, straight, soft, slightly glaucous. Cones from 4 to 5 or 6 inches long, cylindrical, somewhat curved, slightly drooping, short peduncled, with smooth, thin scales, devoid of prickles. Seeds, rather small, obovate, with a long wing. Cotyledons, 6 to 10.

An old, well-known, and useful tree, that is found throughout the northern sections of our country, extending from Virginia into Canada, but more plentifully in Maine, New Hampshire, Vermont, and Northern New York and Pennsylvania. The White Pine forms a large tree, from 100 to 160 feet in height, according to the situation in which it is found. In the extensive pine forests from whence such immense quantities of lumber are annually taken, this species is, in many places, the only one.

seen for several miles; and in such situations it generally presents a tall, naked stem, devoid of branches for at least two-thirds of its length, thus affording valuable logs.

When cultivated for ornament the real beauty of this tree becomes apparent, and although we cannot exactly coincide with the late A. J. Downing in all his views of this species, we, however, think it very handsome and desirable. In comparison with many other species, it is too open or devoid of branches to form a perfectly beautiful specimen.

Its hardness is proverbial, high winds being a greater enemy to it than extreme cold, and a damp, retentive soil far more injurious than a sandy, dry bottom. In fact, the White Pine will never arrive at that perfection in a wet, undrained subsoil, that it would on a gravelly, porous one.

There is a peculiar charm about this tree which makes it an indispensable companion around our homes, and we would as soon think of omitting evergreens alto-

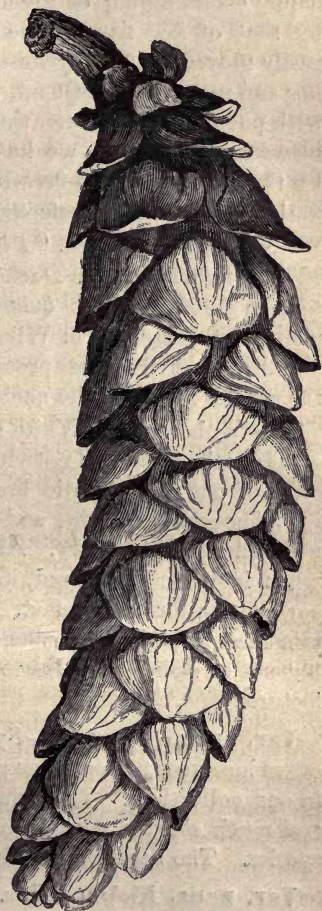


Fig. 19.—PINUS STROBUS.

gether as to be without one specimen at least of the Weymouth Pine. The light, glaucous-green color of the foliage

contrasts beautifully with the other species, and when in motion is remarkably handsome, presenting as it does a happy commingling of green and silver, that is equalled by that of few trees. The long, slender leaves are so easily moved by the slightest breeze, that a constant sighing and moaning is kept up, which has long been a theme with poets; and although this peculiarity is not restricted alone to this species, we have always preferred standing by the side of our old favorite, and listening to this natural Æolian harp in preference to any other.

According to Loudon, "*Pinus Strobus* was first cultivated in England by the Duchess of Beaufort, at Badmington, in 1705. Great quantities were soon afterwards planted at Longleat, in Wiltshire, the seat of Lord Weymouth, where the trees prospered amazingly, and whence the species received the name of the Weymouth Pine."

The lumber of the White Pine is quite as useful as that of any other species, notwithstanding the assertions of some of our transatlantic brethren to the contrary. It is soft, fine-grained, light, and very white, and is in use throughout our country. Although very liable to decay when improperly exposed, its other good properties fully compensate for this defect. The turpentine afforded by this tree is moderately abundant in particular situations, but not of sufficient value to make it an object of manufacture.

Var. alba, Loudon.—Syn. *P. nivea*, Booth, with other incorrect names, is very beautiful, and quite desirable in our collections. The foliage is silvery-white in color, and much shorter, as well as more dense, than that of the species. The bark is very light colored and conspicuous.

Var. nana, Knight.—Syn. var. *tabuliformis*, and var. *umbraculifera*, (of several foreign nurserymen.) A curious dwarf variety not particularly handsome, but frequently planted on account of its oddity. The whole plant, in-

cluding leaves, branches, etc., forms a miniature specimen of the species, with the shape flattened to a tabular form.



ADDITIONAL LIST OF PINES.

In this chapter we desire to enumerate and describe briefly a few of the new and untested species, as well as those which have been thoroughly tested and proven to be entirely too tender for our climate in the Middle States; and in so doing we wish once more to explain our construction of the terms *hardy* and *tender* plants.

On soils that are thoroughly drained, either naturally or artificially, many Conifers, such as the Deodar and Cryptomeria, will succeed very well in the neighborhood of Philadelphia, especially when planted in a warm and protected situation; and yet the same plants, with equally generous treatment in soils that are retentive of moisture, such as a very heavy clay, are frequently denounced as tender and unfit for cultivation by others residing in the immediate vicinity.

As very many Conifers are barely hardy enough to withstand the severity of our winters at this point, a very few degrees further north entirely places them as undesirable, and thus many a well-meaning and strictly honest writer is frequently censured for recommending plants that his readers find, to their cost, tender and undesirable.

Plants, therefore, may very justly be classed as *hardy*, *variable*, and *tender*. The first of these embraces such as are unexceptionably reliable; in the second is comprised those species which it is neither good policy to discard, nor to recommend too highly; and in the third, the undeniably uncertain kinds. It is indeed difficult to assign the true positions of many of our very finest Conifers as to hardiness, and therefore it should be the pleasure of every

arboriculturist to experiment and endeavor to ascertain the requirements of these trees.

This subject is of such importance that, having been frequently misled ourselves, we desire to impress upon the minds of others the necessity of understanding the meaning of these terms; and because a certain plant may not succeed with us, it is no reason that it may not with a more fortunate neighbor, who has probably secured the conditions necessary for its success.

Among these so-called tender species, there may possibly be some, especially those from the higher altitudes on the mountains of Mexico, that may eventually succeed in the warmer portions of the Middle States; but in their general usefulness we place but little confidence, as our extremely variable climate is so totally different from their even, although cold, situations.

As our knowledge of most of the newly discovered Conifers is restricted entirely to the descriptions given by various authors, and principally to those of English writers, we do not feel willing to be held responsible for mistakes in nomenclature, when noticing such plants. Enthusiastic explorers are prone to the fault of renaming old species, not through any desire to impose upon the public, but in most instances by allowing their better judgment to be set aside, for the purpose of receiving that honor which is very justly bestowed upon the discoverer of a new species; and such we are compelled to believe is the case in the new Mexican Pines of Roezl. This discoverer has introduced the *names* of about 120 new species, but which, according to the recent examinations of Gordon, and others, has resulted in obtaining but *five* that are entirely new and previously undescribed.

Those considered as good species are as follows:

38. P. Lawsoni, Roezl.—A medium-sized tree from the higher mountains.

39. *P. protuberans*, Roezl.—Growing upwards of 100 feet high on the mountains, at an elevation of from 9,000 to 10,000 feet.

40. *P. Buonaparteæ*, Roezl.—Grows 130 feet high, with the branches in regular whorls. This is the "*Pino Real*," or Royal Pine of the Mexicans, and is found at elevations from 11,000 to 12,000 feet. It is a splendid species.

41. *P. cornea*, Roezl.—A new and distinct species from the Popocatapetl, in Mexico, at an elevation of from 10,000 to 11,000 feet; said to be fine.

42. *P. Regeliana*, Roezl.—One of the very finest of Mexican Pines, found on the mountains at an elevation of 8,000 or 9,000 feet. Leaves, 10 to 11 inches long, and slender.

The remainder of Roezl's pines are thus classed by Gordon in his recent supplement to the Pinetum :

Fourteen are synonyms of <i>P. Hartwegii</i> .			
Four	"	"	<i>P. protuberans</i> .
One	"	"	<i>P. Orizabæ</i> .
Four	"	"	<i>P. Buonaparteæ</i> .
Three	"	"	<i>P. Loudoniana</i> .
Eleven	"	"	<i>P. filifolia</i> .
Five	"	"	<i>P. Wincesteriana</i> .
Ten	"	"	<i>P. Teocote</i> .
Five	"	"	<i>P. Devoniana</i> .
Eighteen	"	"	<i>P. Pseudo-Strobus</i> .
Three	"	"	<i>P. macrophylla</i> .
Ten	"	"	<i>P. leiophylla</i> .
Four	"	"	<i>P. Lindleyana</i> .
Seven	"	"	<i>P. Russelliana</i> .
Five	"	"	<i>P. Montezumæ</i> .
Five	"	"	<i>P. patula</i> .
One	"	"	<i>P. cembroides</i> .
One	"	"	<i>P. Apulcensis</i> .

Three kinds are not sufficiently known, either to establish their claims as distinct species, or to determine of which they are synonyms.

Our attention will next be directed to the older species of Mexican Pines, as well as to those of the Eastern Continent that we suppose to be too tender for cultivation in the open air with us.

Belonging to the *Binae* section, are the following, viz.:

43. *P. Merkusii*, Vriese.—Is a very tender species from the mountains of Sumatra, Cochin-China, Borneo, etc., where it grows about 100 feet high.

44. *P. Persica*, Strangways.—Is from the south of Persia, where it forms a large tree with rather short, slender branches, and numerous, stiff, deep green leaves.

Gordon mentions a doubtful species from Palestine and Arabia, called by Sieber *P. Arabica*, and which is probably nothing more than *P. Halepensis*.

In the *Ternatae* section we have

45. *P. Canariensis*, Smith.—Is from the Canary Islands, growing 60 or 70 feet high, at an elevation of from 4,000 to 6,000 feet, and forming large forests. This pine makes a beautiful object when grown in pots and sunk in the ground.

46. *P. edulis*, Engelmann.—Syn. *P. cembroides*, Gordon.—Must not be confounded with the *P. cembroides* of Zuccarini, which latter plant is the true *P. Llaveana* of Schiede, according to Gordon's classification.

Prof. Torrey says of this pine, in Pac. R. R. Report: "Rocky places on the Llano Estacado; also near Hurrah Creek, New Mexico, Sept. 20; with ripe seeds. Near Bill Williams' Mountain, Jan. 5. A tree 40 to 50 feet high, called *Pinon* by the Mexicans, and *Nut-Pine* by American travellers. It is found from 150 miles east of

the Rio Grande to the Cajon Pass of the Sierra Nevada. How far it occurs to the southward, we have not been able to ascertain."

Dr. Bigelow, in his description of this tree, says: "It seldom grows large. A little west of the San Francisco mountain, and at the Cajon, it is found from 40 to 50 feet high, but further east it seldom attains more than 24. Its usual height, however, is about 30 feet. The nut is sweet and edible, about the size of a hazel-nut."

We are pleased to add that young plants of this species have stood out in the open air near Philadelphia, for the three past winters, without injury. The leaves are quite frequently in pairs.

47. *P. Chihuahuana*, *Wislizenus*.—Is a tree of some 30 or 35 feet in height, and is found on the mountains of Northern Mexico at an elevation of 7,000 feet.

48. *P. insignis*, *Douglas*.—OREGON PITCH PINE.—This is one of the most beautiful species belonging to the family, and lives in the open air one or two winters if moderately mild. In England it is quite hardy and highly valued. It is a native of California, growing from 80 to 100 feet high.

49. *P. insularis*, *Endlicher*.—Is the Timor Pine from the Philippine Islands and Island of Timor. Its long, slender, dark-green leaves, are very beautiful, but its specific character remains somewhat in obscurity.

50. *P. Llaveana*, *Scheide*.—Syn. *P. osteosperma*, *Wislizenus*; and *P. cembroides*, *Zuccarini*.—Belongs to the large edible-seeded class of pines, of which the *P. Pinea* is the type. It is a native of the barren and sterile hills of Mexico, where it forms a low, spreading tree scarcely ever exceeding 20 feet in height. It is frequently found in cultivation for the value of its fruit. Tender here.

51. *P. longifolia*, Roxburgh.—LONG-LEAVED PINE. —This species forms a splendid plant for pot culture, but is entirely too tender for out-door cultivation in our climate. It is a native of the Himalayas, growing from 40 to 100 feet in height. It produces an abundant supply of very fragrant resin, and on this account the young plants are very liable to be destroyed by field mice. A few years since we had several fine specimens in a cold frame, along with other species of the Coniferæ; but upon examination in the spring found every vestige of bark eaten from our plants of *P. longifolia*, whilst the others remained untouched.

52. *P. Parryana*, Gordon.—Is from the Sierra Nevada in Upper California, forming a large-sized tree with long, slender, wavy leaves, and bright, glossy, yellow cones. It resembles *P. Benthamiana*, and may prove hardy here.

53. *P. patula*, Schiede.—Is one of the most exquisitely beautiful trees known to botanists, and in a large pot or tub forms an excellent representation of a fountain. It is quite abundant in some parts of Mexico, particularly in the colder regions, where it grows to the height of from 60 to 80 feet, and forms the most perfect specimen of a graceful, drooping Conifer that one can imagine.

A specimen of this species in our own collection, after having arrived at the height of 6 feet, was accidentally overlooked in watering, and consequently soon perished; thus, by a dearly bought experience, we learned a useful lesson in regard to growing Conifers in pots.

Var. *stricta*, Bentham, and var. *macrocarpa*, Schiede.—The former with shorter and stiffer foliage, and the latter with very large cones, are possibly not more handsome than the graceful form of the species.

54. *P. Pinceana*, Gordon.—Is another of the graceful Pines for which Mexico is so justly celebrated. It gen-

erally forms a rather large tree of about 60 feet in height, and although the leaves are of but moderate length, the branches and branchlets are remarkably long, slender, and drooping, and present a beautiful effect.

55. P. Sinensis, Lambert.—Of which there are three or four synonyms, is from China and Japan, and is found growing very plentifully, particularly on the more elevated situations. It is about 50 or 60 feet in height, although occasionally not over 30 or 40 feet in some sections.

56. P. Teocote, Schiede.—This is the Candle-wood Pine from the mountains of Mexico, and is a tall, resinous species of about 100 feet in height, with stiff branches, very densely covered with leaves.

Among the tender and uncertain species belonging to the *Quinæ* section, are the following :

57. P. Apulcensis, Lindley.—One of Hartweg's discoveries on the mountains near Apulco, in Mexico. It grows about 50 feet in height, with strong, irregular branches, and slender, wavy, glaucous leaves.

58. P. Ayacahuite, Ehrenberg.—Another Mexican species of large size, growing about 100 feet high, and much resembling the *P. Strobis* in general appearance.

59. P. Devoniana, Lindley.—Also one of Hartweg's discoveries from the Ocotillo Mountains in Mexico, where it is found growing from 60 to 80 feet high. This species has long, slender leaves of a rich shining green color.

60. P. filifolia, Lindley.—Grows from 40 to 60 feet high, and is a native of Guatemala. The leaves are from 12 to 14 inches in length, and very handsome.

61. P. Gordoniana, Hartweg.—Was discovered by Hartweg on the Saddle Mountain in Mexico. It grows

from 60 to 80 feet high, with very long, slender, light green leaves, and, according to Gordon, "has the longest and finest foliage of any kind yet known."

62. *P. Grenvilleæ*, Gordon.—Is likewise one of Hartweg's discoveries, with splendid long, dark green leaves, and a very robust habit of growth. It was first detected in the same locality as the preceding, and attains about the same height.

63. *P. Hartwegii*, Lindley.—Is from the Campanario Mountain, in Mexico, where it was first found by Hartweg, growing from 40 to 50 feet in height. On the Orizaba Mountains, however, it frequently attains the height of 100 feet.

64. *P. leiophylla*, Schiede.—Is a handsome, smooth-leaved pine with a regular form, and is found growing in the colder regions of Mexico, where it attains the height of from 60 to 100 feet. The wood is very hard and resinous.

65. *P. Lindleyana*, Gordon.—Is from the mountains of Mexico, growing about 50 feet in height. Leaves, rather long, stout, and of a dark green color. Although quite hardy in England, it is not so with us.

66. *P. Loudoniana*, Gordon.—Is one of the newer introductions from Mexico, where the trees are said to grow to an immense size. Leaves, very stout, of medium length, and quite glaucous. Cones, *very large* and straight, from 12 to 14 inches long, and from 3 to 4 inches in diameter. Seeds, very large.

67. *P. macrophylla*, Lindley.—A beautiful Mexican pine with dark green leaves, about 14 inches in length. The tree, however, is of only medium size, but compact and striking in its habit. Discovered by Hartweg.

68. *P. Montezumæ*, Lambert. — Forms a medium-sized or rather large tree, from 40 to 60 feet in height, on the mountains of Mexico, and is probably as hardy as any of the Mexican species. Timber, quite excellent.

69. *P. occidentalis*, Swartz. — A species from the West Indies, where it attains the height of 20 or 30 feet, and very much resembles the *P. Halepensis*. It is quite tender in England.

70. *P. oocarpa*, Schiede. — A Mexican species growing from 40 to 50 feet high, with rather long, slender, pendulous leaves of a light green color. The *var. oocarpoïdes*, of Bentham, is a more beautiful plant with slenderer leaves and smaller cones, and perhaps attaining a larger size.

71. *P. Orizabæ*, Gordon. — Is another of Hartweg's discoveries from the Orizaba Mountains, in Mexico, growing only about 30 feet high, but forming quite a handsome tree.

72. *P. Peuce*, Grisebach. (?) — This handsome pine, which has been incorrectly placed as a synonym of *P. Cembra*, by Gordon, is a native of Macedonia, on the sides of Mount Peristeri, and is more nearly related to *P. Strobilus* than to *P. Cembra*. It is the "*Peuke*" of the Greeks, and may perhaps live in our climate.

Since the above was written, we have been enabled to obtain additional and more reliable information in regard to this new pine (?). In the year 1839, Dr. Grisebach was travelling in Rumelia and observed a 5-leaved pine which he thought new. The locality was on Mount Peristeri, an eastern district of Macedonia bordering on Dalmatia, in lat. 41° N., lon. 21° E., and it grew in an uninterrupted wood of trees from 2,400 to 5,800 feet in altitude. In favorable situations it formed a tree about 40 feet high, but

dwindled into a small bush higher up. Endlicher, Loudon, and Gordon, all refer it to the Cembra group, but Dr. Hooker has proved it to be identical with *P. excelsa* of the Himalayas, with rather shorter leaves than those in the Asiatic form. It has been found nowhere between Macedonia and Afghanistan, a distance of 2,200 miles.

73. *P. Pseudo-Strobus*, Lindley.—Has much the appearance of the common White Pine, with long, slender, glaucous leaves, and long cones. It is generally found on the higher mountains of Mexico at an elevation of 8,000 feet, and forming a tree from 60 to 80 feet in height.

74. *P. Russelliana*, Lindley. — Another of those beautiful Mexican pines with dense, dark green foliage, and about the same size as the preceding species. Not hardy here.

75. *P. strobiformis*, Wislizenus.—Is from Northern Mexico, on the higher peaks of the mountains, where it grows to a very large size and attains the height of from 100 to 130 feet. The leaves are short but slender, and of a peculiar light glaucous-green color.

76. *P. tenuifolia*, Benth.—Has rather long, slender foliage, of a beautiful glossy-green color, and grows about 100 feet in height. It is a native of Guatemala, where it often constitutes whole forests.

77. *P. Winchesteriana*, Gordon.—Leaves, very long and glaucous, and borne on stout, spreading branches. It is a native of the Saddle Mountain in Mexico, and attains a height of from 60 to 80 feet.

A doubtful species has been introduced from Mexico under the name of *P. Ehrenbergii*, Endlicher, which is probably but a form of *P. leiophylla*.

The following new and rare species will possibly prove

hardy, but as they are all untested, we have deemed it expedient to place them in a separate list from the main portion of the genus.

78. *P. albicaulis*, Engelmann. — “Syn. *P. cembroides*, *Newberry*, Pac. R. R. Rep. 6, Bot., p. 44, c. ic., non *Zucc.*—An alpine species from the Cascade Mountains in Oregon; may be a western form of this species (*P. flexilis*, James,) though I am inclined to consider it as different, and intermediate between *P. flexilis* and *P. Cembra*, distinguished by the pubescent branchlets, few scattered teeth on the edge of the leaves, and especially by the short oval cones with thick squarrose scales pointed with a knob. The name is suggested by the color of the bark of the tree, which is *as white as milk.*” (Engelmann.)

79. *P. Balfouriana*, Jeffrey. — Has been introduced into English collections, and is described as very distinct and quite hardy, but not proven in the Eastern States to our knowledge. It is a handsome tree 80 feet high, and was first seen by Jeffrey on the mountains of Northern California, at elevations varying from 5,000 to 8,000 feet. The leaves are mostly 5 in a sheath, but occasionally 3 and 4, short, rigid, numerous, and glaucous below. Branches, very flexible and drooping. Cones, very resinous, pendulous, brown, with medium-sized seeds.

80. *P. Frieseana*, says the *Regensburger Flora*, “was called after the eminent botanist at the University of Upsala, Sweden; and is the Pine of Lapponia, which Linnæus and Wahlenburg, without any other comment, classified with *P. sylvestris*. It differs, however, from the latter, in being found at higher elevations than the *Abies excelsa*, whilst *P. sylvestris* is generally found on lower ones. The bark of *P. Frieseana* is likewise cracked, but does not scale off like that of the Scotch Pine. The leaves are more rigid, and their axis from the branches is larger.”

81. *P. lophosperma*, *Lindley*.—A new species from Lower California, of large size, and very handsome. The leaves are from 8 to 10 inches long, and rigid. The cones are from $4\frac{1}{2}$ to $5\frac{1}{2}$ inches in length and 3 inches in diameter, nearly globular, and very glossy. Seeds, very large and crested; hence the name. The young shoots are covered with a light glaucous bloom. Discovered by the collector Lobb, in the year 1860.

82. *P. Torreyana*, *Parry*.—A new and uncertain species from California, closely resembling the *P. Sabini-ana*; the cones of the former are, however, smaller, and the leaves five in a sheath. The foliage is not unlike that of *P. macrocarpa*, but shorter and stouter. The seeds are very large and furnished with a long brown wing. It has been in cultivation in some of the French nurseries, but is unknown in ours. Doubtless hardy with us.

The following group of pines is native to Japan, and as they are yet untested with us, they must occupy a position at present midway between the hardy, tested species and those we have every reason to expect will prove tender in this country. Owing to the similarity of the climate of Japan with that of some portions of our own country, we have sufficient grounds on which to base the supposition that most of these rare Conifers will succeed with us. We have, therefore, described them more fully than we otherwise should have done.

To the excellent new work entitled "Pines and Firs of Japan," by Andrew Murray, F. L. S., we are indebted for the majority of the descriptions and corrections in the nomenclature of this interesting group.

In the *Binæ* section are the following fine species:

83. *P. Massoniana*, *Siebold*.—Syn. *P. sylvestris*, *Thunberg*; *P. rubra*, *Siebold*; *P. Pinaster*, *Loudon*.—Leaves, from 4 to 6 inches long, from rather short, fringed

sheaths, rigid, twisted, slightly flexuose, convex on the outer side, concave on the inner, slightly serrulate on the margin, straight, acute, glaucous-green color. Cones, from 1 to $1\frac{1}{2}$ inches long, sub-conical, incurved, solitary, and numerous; with small, oblong, woody, closely imbricated scales, surmounted by small, very deciduous prickles. Seeds, very small, sub-rhomboidal, chestnut-colored; with short, membranaceous, cultriform, striped wings. Cotyledons, 6.

There appears to have been much confusion in classifying this species, as Loudon, Don, and Gordon, all placed it as a synonym of *P. Pinaster*; but Murray very clearly explains its true and distinct specific character, and gives many interesting incidents in connection with its growth and history principally from observations made by Siebold, and from which we condense the following remarks.

This tree is usually from 40 to 50 feet high, becoming a small shrub at high elevations, although isolated specimens are occasionally found in a wild state growing to a gigantic size.

Along the sea-coast, they are often found much twisted and deformed, owing to their exposure to hurricanes. Of all the Conifers it is the most widely distributed in Japan, not only growing wild, but also in the cultivated grounds. The Japanese display great tact and ingenuity in the cultivation of this pine, and trim it into almost every conceivable form.

Siebold mentions a visit he paid to the celebrated tree called *Theehaus Naniwaga*, the branches of which artificially extended over a circuit of 135 paces; on the other hand, they showed him at Jeddo a dwarf tree planted in a lacquered box, of which the branches did not occupy more than two square inches. Siebold likewise mentions that he saw dwarf trees, on which were united by grafting the greater part of the species and varieties of pine cultivated in Japan. There are a large number of curious varieties of the *P. Massoniana* in cultivation by the

Japanese, amongst which is one with leaves similar to Fremont's Pine, and another with beautiful spotted foliage. The wood is resinous, very tenacious, and durable. Not yet tested here.

84. *P. densiflora*, Siebold. — Syn. *P. Japonica*, *Antoine*; *P. Pinea*, *Gordon*, in *Pinetum*, (1858.)—Leaves, from 3 to 4 inches long, from short, fringed, scale-like sheaths, slender, stiff, acute, slightly serrulate on the margin, convex above, concave beneath, smooth, and subglaucous. Cones, $1\frac{1}{2}$ inches long, short peduncled, conical, obtuse, ligneous, somewhat pendent, terminal, and very numerous; with linear-oblong, woody scales, terminating in a small, very deciduous prickle. Seeds, very small, elliptic, with a striped, dull brown, membranaceous wing. Cotyledons, mostly 6.

Although this species is found growing all over Japan, it is much more plentiful at the north, and frequently forms large forests with *P. Massoniana*. Siebold mentions isolated specimens in the environs of Nagasaki, that were 40 feet high, or over. It is generally very abundant on the mountain slopes, occurring at a height of from 1,000 to 2,000 feet. At an elevation of 3,500 feet above the level of the sea, it becomes a mere bush. It is nearly allied to and resembles *P. Massoniana*, with which species it has been frequently confounded.

Murray says of *P. densiflora*: "A tree often reaching the height of 40 feet, or even more, with a straight, tapering trunk; smooth, cinereous brown bark; the branchlets dirty cinereous brown, glabrous, roughened with the bases of the persistent and falling scales." The lumber furnished by this species is of excellent quality, but the scarcity of large trunks prevents its extensive use. The resin is manufactured into salves, etc., by the Japanese, and the soot is used largely for making India ink.

In the *Ternatæ* section of the Pine Family, there are no species known positively to be natives of Japan, al-

though Japanese authors mention the existence of several having from 3 to 7 leaves in a sheath. Under a supposition that the *P. Bungeana* of Zuccarini, a native of China, may be identical with one of the above, Murray has described it as a native of Japan, and indeed Siebold apparently inclined to the same opinion. On their authority we have accordingly introduced it in our Japanese group of pines.

85. *P. Bungeana*, Zuccarini.—Leaves, from 2 to 3 inches long, from short and very deciduous sheaths, very rigid, crowded on the young shoots, convex on the outer surface, keeled on the inner, serrulate on the margin, frequently in bundles on the ends of the branches, and somewhat in whorls. Cones, $2\frac{1}{2}$ inches long, ovate, or slightly conical, obtuse, with thin, concave scales, ending in a short, stout, reflexed point, somewhat sunken. Seeds, medium size, roundish, with a very short wing.

We make the following extracts from Murray's *Coniferae of Japan*. "The native habitat of Mr. Fortune's tree is far in the north of China, between Peking and the western hills, one of the coldest and most desolate looking districts in winter, which an inhabited and cultivated country can well be.

"The character and habit of this tree is very marked and peculiar. In the young state it is chiefly distinguished from its allies by its light gray bark, and the absence of sheaths to the bundles of leaves. But when of mature age, and grown to its full size, its characteristics are much more remarkable. Its bark peels off as in *Arbutus Andrachne*, leaving the stem and branches nearly white, producing, as may be supposed, a very peculiar effect. The tree, too, grows with a very straight stem to the height of about 4 or 5 feet, and about 2 feet in diameter, or a little more. From this spring numerous branches, not spreading out horizontally or divergently, as in other trees, but rushing straight up to a great height. It is like a pol-

lard, only the branches grow all straight up. After reaching a certain height, they branch out, forming a top or head of the tree."

The same author states that, "looking at the bitter cold of the country from which this species comes, it was, of course, to be expected that it would prove hardy in our milder climate, and so it has proved."

Having succeeded so well in England, and in view of the character of the country of which it is a native, we think it will prosper here.

There are two fine species belonging to the *Quince* section, as follows:

86. *P. Koraiensis*, Siebold.—Syn. *P. Strobilus*, *Thunberg*.—Leaves, from 3 to 4 inches long, with long, very deciduous, transparent, and entire sheaths, slender, filiform, trigonal, clustered at the ends of the branchlets, glaucous-green color. Cones, $4\frac{1}{2}$ inches long, ovate-cylindrical, obtuse, sessile, erect; with numerous woody, coriaceous, glabrous, dull yellowish-brown scales. Seeds, large, oblong, *wingless*, with a smooth, hard, fawn-colored shell. Cotyledons, 11 to 13.

This species is but a small tree growing from 10 to 12 feet in height, and, according to Siebold, probably introduced into Japan from the neighboring Corea. It is only found in cultivated grounds, and is quite rare. The seeds are large and edible.

Murray says: "The tree is allied to the Mexican species discovered by M. Roezl, and described by Mr. Gordon under the names of *P. Buonaparteana*, *P. Veitchii*, etc., etc., especially in the form and appearance of the cone and scales." It is also allied to, and has been confounded with the *P. parviflora*, Siebold, but it is very distinct from this, both in the leaves and seeds.

87. *P. parviflora*, Siebold.—Syn. *P. Cembra*, *Thunberg*.—Leaves, from $\frac{3}{4}$ to 1 inch long, from long, membra-

naceous sheaths, short, stiff, twisted, shortly acute, trigonal, glaucous-green color. Cones, from 2 to 4 inches long, elliptic-oval, obtuse, containing about 50 scales; scales, large, wedge-shaped, coriaceous, sub-orbicular, and ashy-brown color. Seeds, large, obliquely elliptic-obovate, obtuse at both ends, with a short, dark-brown wing, and a smooth, opaque, dark-brown shell. Cotyledons, 8 to 10.

A small or medium-sized tree, which, according to Siebold, is spread by cultivation through all the provinces of Japan, although originally belonging to the north of that empire, extending from nearly 35° N. L., as far north as the Kurile Isles. The trees of this species which Siebold observed in the gardens and public promenades did not exceed 25 feet in height, but upon the north-east slope of the Fakone Mountains he saw more lofty specimens.



2.—**ABIES**, *Tourn.*—SPRUCE. FIR.

Leaves, all of one kind, not clustered. Male aments, in the axils of the leaves. Fertile aments lateral or terminal on branches of the preceding year. Scales of cones thin, not thickened at their apex nor prickly-tipped, persistent or deciduous.

The Spruces, Hemlocks and Firs, are by some botanists placed in the distinct genera *Abies*, *Tsuga*, and *Picea*. The older writers called the Spruce, *Picea*, and the Fir, *Abies*; Linnæus reversed these terms, and we now find writers differing in their use of them, some following Linnæus, and others adopting the views of Link, who adheres to the older nomenclature. As the characters upon which the distinctions of these three genera are founded are not well settled, it better suits the purpose of the present work to place *Tsuga* and *Picea* as sub-genera of *Abies*, as follows:

§ 1. *Abies*.—SPRUCE.—Leaves 4-sided, mostly scattered all around the branches. Anther cells opening lengthwise. Cones nodding or pendent, solitary, terminal, with persistent scales. Seeds without balsamiferous vesicles, parting freely from the wing.

§ 2. *Tsuga*.—HEMLOCK SPRUCE.—Leaves, flat, petioled, appearing two-ranked, channelled above, keeled and mostly whitened beneath. Anther cells opening transversely. Cones, drooping, solitary, persistent. Seed remaining attached to the wing.

§ 3. *Picea*.—FIR.—Leaves, petioled, somewhat two-ranked. Cones, erect at maturity, the scales falling from the persistent axis. Seeds, falling freely from the wing, and having balsamiferous vesicles.

§ 1.—*ABIES*.—SPRUCE.

The Spruces proper are found most plentifully in America, but are also natives of portions of Europe and Asia, especially the colder sections. The finest specimens are from our north-west coast. A large majority of the Spruces being natives of a climate somewhat similar to our own, have very fortunately proven available in landscape gardening with us in many situations. As a general rule, all plants from the Pacific coast, although coming from equally as cold a climate as our own, and in many instances even more rigid, are destroyed by the sudden changes of our Eastern winters.

Although not equalling in value the Pines proper, the timber furnished by the Spruces is, in many instances, of great use in the arts. The White Deal of the *Abies excelsa* and of the *Abies Canadensis* is celebrated in their respective countries for cheapness and value. Other species also furnish excellent lumber, although not in great quantities.

The resinous sap that exudes from the different species is not of equal value with that of the Pines, but is nevertheless occasionally used for various minor purposes. The

young branchlets of the *A. nigra* furnish an excellent essence for forming a popular drink known as "Spruce Beer." Tanning properties are also contained in the bark of some of the genus, and particularly in that of the *A. Canadensis*, which, in some districts where these trees are very abundant, is exceedingly valuable, and large numbers of them are destroyed for this purpose alone.

In parks and pleasure grounds the true Spruces are of the greatest importance, combining as they do a regular conical form with a graceful drooping habit, almost unobtainable in the other genera. Take, for instance, the popular Norway Spruce, which appears to combine in itself all the points necessary to form a perfect tree, and we have the type of the genus.

1. *A. alba*, Michaux.—WHITE OR SINGLE SPRUCE.—Leaves, from $\frac{1}{2}$ to $\frac{2}{3}$ or $\frac{3}{4}$ of an inch long, erect, rather slender, rigid, scattered, needle-shaped, incurved, light glaucous-green color. Cones, from 1 to 2 inches long, oblong-cylindrical, with entire scales. Seeds, very small, with the wing $\frac{3}{8}$ of an inch long.

We have always been pleased with the appearance of this hardy little tree, on account of its compact habit of growth, regular conical outline, and soft, glaucous-green color; and although the branches may have a stiff and formal look, the general outline is so perfect that one loses sight of this imperfection. Its greatest beauty is seen in the young trees, for after having arrived at mature age the foliage becomes deficient and the effect is lost in a measure.

The White Spruce is a native of the northern portions of the United States, Canada, etc., extending very far north to the extreme confines of vegetation, and is generally found along the cold mountain ranges in damp situations, or swampy ground. It grows from 25 to 50 feet in height, according to the nature of the soil and the latitude. Nuttall says that Dr. Richardson found it on the



Fig. 20.—WHITE SPRUCE—*ABIES ALBA*.—FROM A PHOTOGRAPH OF A SPECIMEN, 20 FEET HIGH, IN THE AUTHOR'S COLLECTION.

Coppermine River, in latitude $67\frac{1}{2}^{\circ}$, within twenty miles of the Arctic Sea, where it attained the height of twenty feet or more; but in its usual native forests it rarely exceeds 50 feet in height. The same author also mentions, according to Loudon, a tree growing in Down, Ireland, 60 years planted, which measures 55 feet in height; and another in Galway, at Cool, is 56 feet in height, with a diameter of $2\frac{1}{2}$ feet.

This species, from its close resemblance to *A. nigra*, or Black Spruce, has been considered by some botanists as a well-marked variety of the latter, with less numerous and longer leaves, and having cones of a different form, with entire scales. We are inclined to think its specific distinction is based on a rather unsubstantial foundation, and would have been pleased had our authorities seen proper to have reduced it to a variety. It is much less common than the Black Spruce, and is generally found growing in the same situations, although the former is found a few degrees further south. The wood is inferior to that of the latter, and the young shoots, when bruised, have an unpleasant odor.

The charming color of this tree, and particularly of the young plants, has made it a great favorite with arboriculturists, and for ornamental purposes it is very far superior to the Black Spruce; indeed, the latter species is not usually considered of sufficient excellence to be classed among the ornamental trees. In a group of the darker-foliaged evergreens, a fine plant of *Abies alba*, placed in the foreground, will always excite admiration from the lively contrast exhibited; and when we take into consideration its perfect hardiness, we have no hesitation in pronouncing it one of our most desirable species.

There is a variety (in the common acceptation of the term) called *cœrulea*, with a light bluish tint on the foliage, which is recognized by some foreign nurserymen;

but as this peculiarity is so changeable and of such little value, it has not been recognized in this country.

Var. nana, Loudon.—Is a very pretty, compact, small bush, about 3 feet in height, like the species in other respects.

Var. minima, Knight.—Is quite rare, and remarkably dwarf in its habit. It is of French origin and is given by Carriere as *Picea alba echinoformis*. It is so minute in every portion of the plant, and so regularly globular in outline, as to suggest the name of "Hedgehog Spruce."

Var. glauca, Plumbly.—DIMSDALE'S SILVER SPRUCE.—Is another handsome and distinct European variety, as yet unIntroduced into this country. It has very silvery glaucous leaves, but in size equal to the species.

2. A. excelsa, De Candolle.—NORWAY SPRUCE.—Syn. *A. Picea*, Michaux and Miller, not of Lindley.—Leaves, scarcely 1 inch in length, rigid, curved, scattered, acute, dark green color. Branches, numerous and drooping. Cones, from 5 to 7 inches long, pendent at maturity; with slightly incurved, rhomboidal scales. Seeds, barely $\frac{1}{8}$ of an inch long, reddish-brown color, acute and rough, with a long wing. Cotyledons, 7 to 9.

This tree has become so common that, to describe it, one feels as if introducing an old and intimate friend. A recent writer has said of this tree that it is "so well known and so useful, that the term *evergreen* has become almost synonymous with *Norway Spruce*."

The Norway Spruce is found in the northern climates of Europe and Asia, and becomes rare in descending towards the south. In France, Italy, and Spain, it abounds only among the mountains, in deep valleys, and on declivities exposed to the north. On the Alps, at an elevation of from 4,000 to 6,500 feet, it comprises vast forests, and occasionally at a still greater elevation it grows in a dwarfish state. It is also grown in large quantities in

portions of Norway, Sweden, Russia, etc., young seedlings having been planted for the purpose of growing timber.

This species usually attains the height of from 120 to 150 feet, and from 3 to 5 feet in diameter, and is said to require a century to perfect its growth. It is therefore very probably the largest Conifer, if not the largest tree in Europe, and certainly the most valuable, for the colder countries especially.

In a comparison of the *A. excelsa* with our native species, we must confess to having not one that will compare with this invaluable tree for every purpose. Its great hardiness enables it to withstand the utmost rigors of every portion of our country, and the ease with which it adapts itself to almost every soil stamps it as superior in that respect. Its gracefulness of outline, rapidity of growth, and dark verdure, also render it particularly pleasing, and have placed it at the head of the list of ever-green trees.

On the other hand there is a certain monotony in a large belt or clump of Norway Spruces that produces an impression of sameness, so that they should never be used indiscriminately, but with a careful judgment and an appreciating taste as to effect.

Meehan, in his *Hand-book of Ornamental Trees*, says: "There is a great diversity of opinion respecting the merits of this tree in a landscape. The objection is chiefly to the monotonous formality of its appearance; yet when it is in a situation highly artificial, or extra-natural, as near ornamental buildings, on rugged rocky places, or on the tops of informal hills, there is probably nothing more beautiful."

Downing considered it by far the handsomest of the Spruces, and adds: "The Norway Spruce is the great tree of the Alps; and as a park tree, to stand alone, we scarcely know a more beautiful one. It then generally branches not quite down to the ground, and its fine sweep-

ing, feathery branches hang down in the most graceful and pleasing manner."

Gilpin, who was almost a cynic in his dislike to regularly formed trees, and who disliked the White Pine on account of its smooth bark, even, conical form, and the exact disposition of its branches, thus speaks of the Norway Spruce: "The Spruce Fir is generally esteemed a more elegant tree than the Scotch Pine, and the reason, I suppose, is, because it often feathers to the ground and grows in a more exact and regular shape; but this is a principal objection to it. It often wants both form and variety. We admire its floating foliage in which it sometimes exceeds all other trees; but it is rather disagreeable to see a repetition of these feathery strata, beautiful as they are, reared tier above tier in regular order, from the bottom of a tree to the top." The same author further speaks of having its interest heightened by an accidental loss of branches, etc. Gilpin, it appears, is not alone in this opinion of the Norway Spruce, for it seems that the author of the *Planter's Kalendar* says "that next to the Lombardy Poplar and the Scotch Pine, it is the least ornamental of common trees."

The writings of Sir James Edward Smith, and Sir Thomas Dick Lauder, abound in praises of this tree, especially when seen in its wild, native beauty, and associated with the grandeur of the Alpine scenery.

To the uninformed planter who has but a limited space to devote to ornamental trees, we say plant the Norway Spruce, but at the same time bear in mind that the little plot of 10 or 12 feet square is not the place for it. A too common error in our rural villages is that of crowding species of the largest size into a small place that would scarcely contain a large-sized shrub, and the consequence is that after a few years, the tree has to be removed or destroyed.

Another advantage that this species has over most other

trees is its great value for shelter, for which we have already advocated it in our chapter devoted to Hedges and Screens. A thickly planted belt of these trees on the north side of an orchard, or of young plantations of ornamental trees, or even of the house and farm buildings, proves an effectual barrier to the high, cold winds that frequently come from that quarter and destroy our fruit crop, or our half-hardy plants, as well as increase our bills for fuel during the winter months.

On the Western prairies pomologists are awakening to a just sense of this important subject, and of all the hardy evergreens this appears to be the most suitable for shelter. Dense and compact in its growth, hardy to the utmost degree, and vigorous in almost every soil, it is certainly the perfection of plants for a screen. These clumps and belts may by a judicious planting create quite a pleasing effect, and instead of appearing as a work of art, as when planted in a formal line or avenue, they may be placed in such a manner as to preserve a graceful, easy, flowing outline.

For enclosures or divisions to ornamental grounds where animals are excluded, it forms a beautiful hedge, bearing the shears with impunity, becoming very dense, and retaining that peculiar dark green color so universally admired. We are now experimenting with almost every plant that is at all available for this purpose, and on a short trial are decidedly of the opinion that the Norway Spruce will prove the most useful, especially where a large sheltering hedge or screen is required.

The timber furnished by this species is quite valuable, and plantations in many parts of Europe are annually being formed for growing it. The wood is almost devoid of resin, light, white, and quite elastic. It is termed White Deal, and is used in many portions of Europe as the White Pine is with us. The bark is also valuable for tanning, and the resin that exudes from under the bark is consumed for common purposes.

Like the majority of our well-known and very popular plants, this species has a large number of varieties. Some of these are very distinct and desirable for creating effects in gardening, whilst others approach so near the true form of the species as to be unworthy of recording. Loudon names some 10 or 12 varieties which differ only in their manner of growth and color. As every year adds to the number of these foreign varieties, or rather chance kinds, the greater will be the drain on the finances of our own cultivators; we would therefore guard our readers against placing too much dependence upon the glowing descriptions which frequently herald them, as they are very frequently propagated for the sole purpose of increasing the list of names in catalogues, without any distinction to justify such a course.

Var. Carpatica, Loudon.—Is not recognized as distinct from the species by Gordon, but Loudon says that its leaves are long and very dense, and that it has very vigorous shoots.

Var. Clanbrasilliana, Loudon.—Is a very small and compact growing bush originating in Ireland, and introduced into this country some years ago. It is quite pretty.

Var. denudata, Hort.—Syn. *A. e. virgata*, *Jacques*.—A very curious French variety, somewhat resembling var. *monstrosa*, but with more twiggy, reflexed, and spreading branches, and with the leaves stouter and more appressed.

Var. elegans, Loudon.—Another of the pretty little dwarfs, with very slender and light green foliage. It is also quite compact in growth and desirable.

Var. eremita, Knight.—Syn. *A. e. miniata*, *Knight*.—According to Gordon, this “nearly approaches *A. e. monstrosa*, but is much less branching, and with the bark generally of a much redder color.”

Var. Finedonensis, Paul.—A new kind, of which Gordon says: “A striking variety of the Common Spruce,

with all the younger leaves on the upper side of the shoots at first of a pale yellow or straw color, as well as the young wood, but afterwards, as they get older, they change to a bronzy-brown, and finally, when fully matured, become light green; while those leaves on the under side of the shoots and fully shaded branchlets are more or less green from the first."

Var. Gregoryana, Paul.—A very neat little dwarf from Cirencester Nursery in Gloucestershire, of an exceedingly dense habit of growth, and furnished with very numerous small, sharp, stiff leaves.

Var. inverta, Smith.—The curiously inverted branches of this variety are quite distinct from those of the *var. pendula*. All the branches are remarkably drooping in their habit, and the leaves are larger and brighter than those of the species.

Var. mucronata, Loudon.—Is a French discovery and another dwarf kind, with short, thick, dark green leaves, and crowded, irregular branches. It is said to be very distinct.

Var. monstrosa, Loudon.—Is extremely curious, having heavy, straggling branches, and is said to resemble the *Araucaria imbricata* in appearance.

Var. nigra, Loudon.—Syn. *A. gigantea, Smith.*—*A. Lemoniana, Booth.*—Has larger cones and darker foliage than the species; otherwise closely resembling it.

Var. pendula, Loudon.—The leaves of this variety are longer than those of the species, and of a dark glossy-green color. The branches and branchlets droop quite gracefully. This is one of the most desirable.

Var. pyramidalis, Hort.—The branches of this French variety differ from those of the species in being remarkably fastigiate and of very compact growth.

Var. pygmæa, Loudon.—Which is known under the

several names of *nana*, *minima*, *pumila*, and *minuta*, grows only about 12 or 18 inches high, and spreads some distance over the ground. It is very curious and dwarf.

Var. stricta, *Loudon*.—Syn. *A. Clanbrasiliana stricta*, *Lawson*.—*A. excelsa conica*, *Keteleer*.—*A. communis fruticosa*, *Endlicher*.—Another pretty little dwarf variety rarely exceeding from 3 to 4 feet in height, with numerous, erect branches, and small, closely compressed, slender, bright green leaves. Quite desirable.

Var. tenuifolia, *Loudon*.—Is also known as *var. attenuata*, and *var. microphylla*, by different authors. It is chiefly distinguished by its attenuated branches and small, slender foliage.

Var. variegata, *Loudon*.—Is of very little account; a few of the leaves and lesser branches spotted with yellow and white.

3. A. Menziesii, *Douglas*.—MENZIES' SPRUCE.—Leaves, $\frac{3}{4}$ of an inch long, broadly linear, rigid, stout, sharply acute, incurved, light green above, silvery-glaucous below. (Leaves stouter than in any other allied species, stiff, and very acute, almost spinescent. *Engelmann*.) Branches, tubercled, with resinous, ovate, acute buds. Cones, from 3 to 4 $\frac{1}{2}$ inches long, cylindrical, pendulous, very numerous, crowded; with elongated-rhombic scales, truncate, irregular on the margin; bracteoles, small, lanceolate, acute. Seeds, small, flat, light brown, with triangular-obovate wings.

This beautiful Conifer was discovered by Douglas in Northern California, where it is quite abundant in many sections, but principally in rich, moist soils. Nuttall speaks of it as "constituting the principal part of the lofty and dark forest which caps the summit of Cape Disappointment, at the entrance of the Columbia or Oregon." It is also found plentiful on the Island of Sitka, and in the Shasta Country." Dr. Engelmann says it "is entirely sub-alpine, occurring between the limits of 7,000 and 9,000

feet in low, moist, or marshy soils, especially on the borders of streams."

The general height of this species is about 60 or 70 feet, but in the rich, deep, alluvial soils along the rivers, specimens 100 feet in height have been found.

In our grounds the Menzies' Spruce has proven entirely hardy without artificial protection, and so far as we have been able to ascertain, such has also been the experience of other cultivators in the Middle States. Indeed, coming from so high an elevation and from such exposed situations, we might readily believe that such would be the case.

Sargent, however, in his description of this tree, mentions that the foliage is occasionally scorched on specimens in his grounds, from which it would appear that young plants would thrive much better in the shade in more northern localities, as the sudden changes from heat to excessive cold are the cause of this destruction of the foliage.

There is an inclination on the part of the leaves to be deciduous, and during heavy storms, or when in contact with other trees, the foliage is often completely removed from the young shoots, thus greatly disfiguring the tree. This interferes with its otherwise beautiful form, and can only be prevented by placing it singly on a lawn, and never allowing anything to rub against the foliage.

This dropping of the leaves is more prevalent in trees that are growing in dry, sandy soils, showing that the most suitable position for it is in rather moist situations, especially near the bank of a stream where the air is charged with moisture.

Its growth is exceedingly rapid in soils that are suited to it; and T. Meehan mentions a tree of this species that was planted 6 years ago, then 3 feet high, that is now 15, with a perfectly straight leader and as fine a conical shape as could be desired.

We make the following extracts from the description

of this tree by J. Jay Smith, Esq.: "Menzie's Spruce appears to thrive best in situations where the soil is moist for the greater part of the year; in low bottoms, not absolutely flooded, with a moist atmosphere, it grows extremely fast.

"It is likewise found to thrive well in Scotland, and of course in our northern and central regions; on the most exposed moors it never suffers, but, on the contrary, the peaty soil and humid atmosphere appear favorable to its growth. On dry soils it frequently loses a portion of its leaves during the dry weather, and this gives it a shabby appearance and has led some to condemn it. In such situations it should be liberally supplied with water during the growing season."

The general form of the tree is a perfect cone with a straight leading shoot, and mostly a very compact and well regulated head; this is somewhat stiff and formal in outline, somewhat of the character of the White Spruce. The foliage is of that peculiar commingling of green and silver so admired in the glaucous-leaved evergreens. The cones are particularly conspicuous, being very numerous, crowded, and when young, almost white in appearance.

In propagating the *A. Menziesii*, the stock of young plants may very readily and rapidly be increased by means of "heeled cuttings," that is, young branchlets taken off with a small portion of the older wood attached. As a general rule the species of *Abies* will all root more or less easily, the Firs with some difficulty, and the Pines very rarely, excepting in the hands of skillful gardeners.

Douglas states that the timber furnished by this species is of excellent quality, and Dr. Parry found it "a finely shaped tree, though of rather stiff outline, of rapid growth; wood very compact, but rather coarse-grained and pitchy; the logs taper too rapidly to saw up to advantage."

Var. *crispa*, Antoine.—Mentioned by Gordon as differ-

ing only from the species in having the margins of the scales on the cones more undulated, or somewhat jagged, and more extended.

4. *A. nigra*, Poiret.—BLACK OR DOUBLE SPRUCE.—Leaves, very short, scarcely exceeding $\frac{1}{2}$ of an inch long, erect, stiff, somewhat quadrangular, very dark green color. Branches, spreading horizontally, with a smooth, dark bark. Cones, from 1 to $1\frac{1}{2}$ inches long, ovate, or ovate-oblong, changing from a dark purple to dull reddish-brown color; scales, very thin, roundish, with a toothed and uneven margin. Seeds quite small, with a small, rigid wing.

The Double Spruce is found in the same localities as the Single Spruce, and in most situations more plentifully; according to Gray, in swamps and cold mountain woods, New England to Wisconsin and northward, and southward along the mountains. It is also occasionally seen further south than the latter species, especially along the Alleghanies. In the Canadas, Nova Scotia, New Brunswick, and even further north, it is quite abundant, and resists the severe Arctic winters in those latitudes. Indeed in our more southern climates this tree rarely ever forms so fine a specimen as when growing in its native habitats, with their cold, chilling winds and short summer seasons.

In favorable situations the Black Spruce forms quite a large tree, about 75 feet in height, with a tall, straight, tapering trunk, and a very handsome, regular, conical-shaped head. In the deep, rich, alluvial soils, the finest specimens are to be found, and in such an isolated plant presents a very agreeable sight; but when growing in compact masses as they quite frequently do, leaving only 3, 4, or 5 feet space between the trunks, they run up to a great height and are destitute of branches, excepting a small, dense head upon the summit.

As an ornamental tree we cannot recommend it, although the young plants are occasionally quite beautiful; but after

obtaining some age, the trees generally present a rather sickly and open appearance, which is the reverse of ornamental. On particularly favorable soils we have seen very good specimens, but they are so rare that it is unwise to expect perfection; and especially is this the case on thin, gravelly soils.

The timber of this species is valuable for many purposes, the body of the tree furnishing long, straight logs, and the wood is light, very elastic, and strong. As fuel, however, it is quite inferior, owing to the quantity of air contained in it, which causes a continual snapping, such as is usually observed in burning chestnut. The celebrated Spruce-beer is made from an infusion of the young branchlets of this tree, and furnishes a popular drink.

Var. rubra, Michaux.—RED SPRUCE.—Syn. *A. rubra, Poiret.*—We do not think this sufficiently distinct to form a separate species. Michaux first examined it thoroughly, and classed it as a variety of *A. nigra*; and Loudon remarks: "As the variety appears tolerably distinct in British gardens, as far as respects the color of the cones, we have, for convenience' sake, given it as a species; though we entirely agree with Michaux in thinking it only a variety."

Although Poiret, Lambert, Pursh, and others, have described it as a true species, they appear to have no foundation for their claims, excepting in its larger and redder cones and reddish-brown bark. However this may be, the Black and Red Spruces are found growing in the same localities, are equally valuable for timber, and in all characteristics excepting those mentioned are precisely alike.

Var. pumila, Knight.—Is a dwarf, stunted bush, only 3 or 4 feet in height, and forms a dense little plant with quite slender foliage. Not yet found in our collections.

5. *A. obovata, Loudon.*—OBOVATE-CONED SPRUCE.—Syn. *A. Wittmanniana, Hartweg*; *A. Ajanensis*, and *A.*

Schrenkiana, *Lindley*, etc., etc.—Leaves, from $\frac{3}{4}$ to 1 inch long, thickly scattered, slender, straight, sharply acute, bright green color. Branches and branchlets quite numerous, whorled, rigid, spreading, with numerous very small, dark colored buds. Cones, from 2 to $2\frac{1}{2}$ inches long, obovate, with loose, entire, wedge-shaped scales.

This species very closely resembles the *A. Orientalis*, and by some modern botanists is thought to be identical with it. Gordon contends, however, that it is very distinct from the latter, and in the absence of sufficient personal knowledge we have adopted his views.

The Obovate-coned Spruce also resembles the Norway Spruce in its general characteristics, but is much more dense and compact in growth than the latter, being supplied with an almost innumerable quantity of small branchlets, thus imparting a certain beauty to the tree that is scarcely ever found in the latter species. The color of the leaves of the *A. obovata* is said to be usually of a paler green, amounting in some instances to a yellowish-green, but such specimens as have come under the writer's observation have been uniformly very dark.

This species is found most plentifully on the Altai Mountains in Siberia, at elevations varying from 4,000 to 5,000 feet, and is consequently hardy throughout the Northern States. Its greatest height is perhaps 100 feet, but according to some writers it diminishes in stature and foliage, according to soil, situation, and elevation, and like all other coniferous trees from northern regions is subject to great variation in appearance.

Having tested this species for several years without protection, and proven it to be entirely hardy and perfectly adapted to a variety of soils, we feel no hesitation in recommending it to those who have a large collection; but for small plantations we are under the impression it will never be popular, owing to its close resemblance in many respects to our favorite Norway Spruce; however, at a

more advanced age, this may be counterbalanced by its close, compact habit and unique appearance.

6. *A. orientalis*, Poiret.—EASTERN SPRUCE.—Leaves, $\frac{1}{2}$ of an inch long, tetragonal, rigid, stout, rather obtuse, dark shining green color. Branches like the foregoing species, numerous, and slender. Cones, $2\frac{1}{2}$ to 3 inches long, cylindrical; with the scales soft, thin, loose, rounded, and uneven on the margins. Seeds, very small and resinous.

A native of the coast of the Black Sea, and is found growing on the Mountains of Imeretia, in Upper Mingrelia, and the neighborhood of Teflis, forming whole forests between Gunil and the Adshar Mountains. Tournefort says he found it growing in the vicinity of Trebisonde, where it is known by the name of "*elate*."

As stated in our description of the preceding species, many writers considered that synonymous with the present tree; so L. Deslongchamps classed *A. Orientalis* as a variety of *A. alba*, and Loudon, as a variety of *A. excelsa*.

It is about 75 feet high, of a regular, conical form, and in specimens standing apart from others furnished with branches to the ground.

It is so thick and close as to be considered a perfect model of the compact class of Conifers, and on this account may be recommended for cultivation. Our specimen has been out for several years, and is equally hardy as the Norway Spruce, but exceedingly like the *A. obovata* in many leading characteristics.

The timber furnished by this species resembles that of the foregoing.

7. *A. Pattoniana*, Jeffrey.—PATTON'S GIANT SPRUCE.—Leaves, $\frac{3}{4}$ of an inch long, numerous, thinly scattered, curved, triangular, light green color, and glaucous beneath. Branches, numerous, slender, somewhat drooping, and covered with a dark, rough bark, and woolly pubescence. Cones, 1 inch long, cylindrical or oblong, crowded,

smooth, with numerous, mostly entire, and loosely imbricated scales. Seeds, quite small.

A magnificent species from Upper California and northward. It was first discovered by Lewis and Clarke, and was afterward found by Jeffrey in Northern California, and named by him "in compliment to Mr. Patton of the Cairnies, in Scotland, a gentleman much interested in Conifers."

The size of this gigantic species varies considerably in the different localities where it is found, but the greatest heights mentioned by the discoverers appear almost incredible. Those described by Lewis and Clarke were frequently 300 feet in height, and without any branches on the stem for more than 200 feet, with a circumference of 42 feet at a point beyond the reach of an ordinary-sized man.

Jeffrey says: "It is a noble tree, rising to the height of 150 feet and $13\frac{1}{2}$ feet in circumference, and towering above the rest of the forest; but as it ascends the mountain, it gets gradually smaller, until at last it dwindles down into a shrub not more than 4 feet high."

We have not yet tested this new and rare Conifer in the open air, but as it comes from a high elevation (from 5,000 to 6,000 feet) and a section of country that produces other trees that are hardy with us, we feel sanguine it will be successful here. In England it is entirely hardy and much admired, but its great scarcity, and the consequent high price at which the young plants are held, will be a serious obstacle to its general trial in our country.

8. *A. Smithiana*, *Loudon*.—HIMALAYAN SPRUCE.—Syn. *A. Morinda*, *Hort.*; *A. Khutrow*, *Loudon*, with numerous others under *Pinus*, *Picea*, etc.—Leaves, 1, $1\frac{1}{2}$, and 2 inches long, spreading, tetragonal, straight, rigid, very sharply acute, pale green color, slightly glaucous beneath. Branches and branchlets, numerous, horizontal, and drooping, with light colored bark; the branchlets remotely

verticillate. Cones, from 6 to 7 inches long, ovate-oblong; scales, light brown, oblong, entire, smooth, loosely imbricated, and enclosing small, dark brown seeds, with yellow, thin, membranaceous wings.

This remarkably beautiful tree, although thoroughly tested for several years, does not, as far north as Philadelphia, yet give that satisfaction which many were at first led to expect. Specimens on dry, gravelly subsoils succeed very well, but where the soil is retentive of moisture, the leading shoot is almost invariably killed.

It is a native of Bhotan, China, Japan, etc., generally frequenting the mountain districts, and forming even on very high elevations magnificent specimens not unlike the Norway Spruce in shape and character, but more graceful in growth and delicate in color. On the Himalayas, at elevations varying from 7,000 to 12,000 feet, it forms a tree of from 100 to 150 feet in height, and from 18 to 20 feet in circumference. Capt. Hodgson measured the trunk of one that was 169 feet in length.

No one should attempt to introduce this tree unless every care and attention can be bestowed upon it after planting, having first selected a congenial spot. The Himalayan Spruce is almost invariably found on the northern declivities of the mountains in its native country, and therefore requires either a partially shaded aspect or a northern exposure. In the latter case, if a belt of evergreens or other protection be afforded it, fine specimens may be obtained, but as it belongs to that class of uncertain trees neither tender nor yet entirely hardy, care is absolutely necessary to induce it to thrive properly.

We know of no tree whatever that is more luxuriant and beautiful in a proper situation, or, on the other hand, a more dejected looking, pitiable sight in an improper one, than the *A. Smithiana*.

Having experimented with this species for a number of years in several situations, we are of the opinion that when

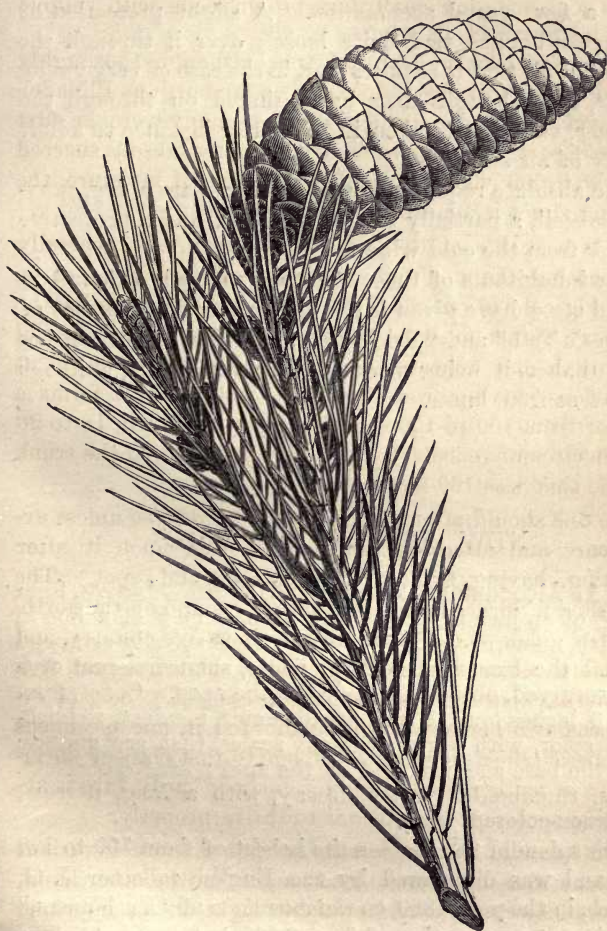


Fig. 21.—*ABIES SMITHIANA*—HIMALAYAN SPRUCE.

the foregoing directions are adhered to, it may be successful as far north as this locality, (Philadelphia,) especially after a few years' acclimation. A slight protection of evergreen boughs, tied quite loosely over it through the winter, is all that it requires; or, in the case of very young plants, these boughs may be continued on through the summer, care being taken in the latter instance to admit plenty of air and light.

The absolute requirements of this tree are a dry, gravelly subsoil, a partially shaded situation, and a protective barrier from the cold winds.

The inhabitants of those countries where it is found in a wild state have given it the rather uninviting names of "Tiger's Tail," and "Prickly Fir." This species furnishes poor timber, it being very perishable and soft, although quite free from knots.



NEW SPECIES OF ABIES.

9. A. Alcocquiana, Lindley and Veitch.—Leaves, from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch in length, and from $\frac{1}{2}$ to $\frac{3}{4}$ of a line in breadth, numerous, closely approximated, spirally arranged around the branches, solitary, linear, sub-tetragonal, flat-tish, recurved, obtusely rounded at the apex. Cones, from 2 to 3 inches long, 1 inch in diameter, pendent, reddish-fawn color, with very persistent scales, that are cuneate near the base and rounded at the apex; bracts, obsolete. Seeds, rhomboidal, partly downy, with a long, narrow, cinnamon-colored wing.

This splendid tree reaches the height of from 100 to 120 feet, and was discovered by the English collector, J. G. Veitch, in the year 1860, on the mountain of "Fusi Yama," growing at an elevation of from 6,000 to 7,000 feet. The branchlets are very rough, with protuberances having the appearance of small pegs projecting out on all sides. The

color of the young branchlets is pale fawn, and of the older ones, reddish.

We do not think this species has been introduced into this country, but from the representations of the discoverer, we should be pleased to hear of its success with us. Gordon places it in the *Tsugas*, on account of the rather flattish leaves; but we prefer to follow the example of Murray, and include it in the list of true Spruces, from the fact of its leaves being spirally arranged all around the branches and not in two rows.

10. A. Engelmanni, Parry.—ENGELMANN'S SPRUCE.—
Syn. *Picea Engelmanni*, *Engelmann*; *Abies nigra*, in *Sill. Jour.*—Leaves, in the higher localities, 6 to 9 lines long, and not quite 1 line broad, strongly carinate below, less so above, with a few lines of white stomata above and below, abruptly but not sharply acute; in lower localities the leaves are more slender, and 8 to 12 lines long. Male aments, 6 to 9 lines long, on short stipes; anthers, $1\frac{1}{2}$ lines long; female aments, 9 to 10 lines long, with ovate, lanceolate scales, almost equalling in length the dark purple, fleshy scales. Branches, mostly small, lower ones horizontal, upper ones, ascending, with scaly, reddish, grayish-purple, or light purplish-brown bark, containing much tannin. Cones, $1\frac{1}{2}$ to $2\frac{1}{4}$ (usually less than 2) inches long, $\frac{3}{4}$ of an inch or less in diameter when closed, ovate-cylindrical, scattered on the tree, not abundant, becoming reddish-brown with age; scales, rhombic, with truncated ends in good specimens, but shorter, more rounded, and with the truncation indistinct, in poor ones. Seeds, 1 line long. Cotyledons, 6, rarely 5. (Extracted from Engelmann's description.)



Fig. 22.—ABIES ENGELMANNI.

dical, scattered on the tree, not abundant, becoming reddish-brown with age; scales, rhombic, with truncated ends in good specimens, but shorter, more rounded, and with the truncation indistinct, in poor ones. Seeds, 1 line long. Cotyledons, 6, rarely 5. (Extracted from Engelmann's description.)

According to Dr. Engelmann, in the "Transactions of the St. Louis Acad. of Science," this fine new Conifer is found on the "higher parts of the Rocky Mountains, from New Mexico to the head waters of the Columbia and Missouri Rivers, and probably further; from the sub-alpine to the alpine districts, and with *Pinus aristata* reaching the highest limits of timber, occupying in Colorado a belt between the limits of 8,000 and 12,000 feet. It reaches its fullest development between 9,000 and 10,000 feet, near the head waters of the streams on both slopes of the Snowy range, constituting magnificent forests about the head of Middle Park, at Tarry-all, etc., often mixed with *Abies grandis*."

The same author thus speaks of its size: "In its most favorable localities this species makes a stately tree 60 to 100 feet high, forming a narrow, sharply tapering spire of a rather darkish hue; trunk perfectly straight, columnar, tapering very gradually, $1\frac{1}{2}$ to $2\frac{1}{2}$ feet in diameter, branches mostly small, lower ones horizontal, upper ones ascending; on higher altitudes it is a smaller, nearly round-topped tree, very much branched, bearing more perfect fruit than in either lower or higher elevations; on the highest summits a prostrate and almost creeping sterile shrub, just as *Picea nigra* is found on Mt. Washington, N. H."

This species was at first taken for a form of the *A. nigra*, by its discoverer, Dr. Parry, but upon subsequent examination it has proved to be a new species. We have raised young plants from the seed furnished us by the discoverer, and will soon be able to settle the question of its hardiness with us.

Dr. Engelmann says "the wood is soft, white, not knotty or resinous, therefore much esteemed for inside and cabinet work."

11. *A. firma*, Siebold & Zuccarini.—Syn. *Abies Momi*, Siebold in Verhand.; *Pinus firma*, Antoine & Endlicher;

Picea firma, Gordon; *Abies homolepis*, Siebold & Zuccarini; *Pinus homolepis*, Antoine & Endlicher; *Abies bifida*, Siebold & Zuccarini.—Leaves, from $\frac{1}{2}$ to 1 inch in length, very closely approximated, growing all around the shoot, but expanded in a two-rowed manner, slightly attenuated at the base into a very short petiole, slightly twisted, linear, bifid at first, glabrous and dark above, somewhat silvery below. Cones, 3 to $4\frac{1}{2}$ inches long, from 1 to $1\frac{1}{2}$ inch in diameter, pendent, short-peduncled, thick, deflexed, straight, cylindrical, with persistent, imbricated, downy, leathery, crenulated, dark brown scales; bracts, long, lanceolate, or sub-rhomboidal, sharp and keeled. Seeds, wedge-shaped at the base, with broad, transverse wings, and a membranaceous shell. Cotyledons, 4 to 5.

We copy from Murray the following history of this new Spruce: "This species is found from the south of Kinsu, by Sikok and Nippon, to the Kurile Islands, and may thus be assumed to extend over the whole of the empire of Japan. It grows at an elevation of from 2,000 to 4,000 feet above the level of the sea. Siebold informs us that at its southernmost limits it is probably cultivated, and not wild, except in humid valleys or on the mountain Iwaga, near Nagasaki, where it is found at about 1,800 feet above the sea." It is a lofty tree with somewhat of the habit of the Common Silver Fir, and, judging from the climate from whence it comes, we may anticipate its successful introduction into our collections. As with others of the Japanese trees, confusion has arisen in its nomenclature, some writers affirming that *A. firma*, *A. bifida*, and *A. homolepis*, are three distinct species. Murray affirms them to be but one, and suggests that the diversity may have arisen from the skill of the Japanese in altering the appearance of many plants in a manner to deceive a careful and critical botanist. In *A. bifida*, the leaves are bifid at the apex, but Murray states that this is frequently the case with young plants of all three of the alleged species; seeds of *A. bifida* frequently producing young

plants answering the description of *A. homolepis* in the first year, and having leaves bifid during the second, etc.

12. *A. Jezoensis*, Siebold & Zuccarini.—Syn. *Pinus Jezoensis*, *Antoine & Endlicher*.—Leaves, from 8 to 12 lines in length, very persistent, (for seven years), spirally arranged, alternate but not distichous, sessile, linear, acerose, acute, and terminating in a spinous point, entire, obsoletely 4-sided, bright green above. (Mature cones not known.) Female aments, solitary, oblongo-cylindrical, sub-curve; bracts, minute, rhomboidally spathulate, alternated from the base, acute or cuspidate, somewhat crenulated, appressed, and smaller than the scale. (Murray.)

In our description of *Abies Fortunii* will be found the characteristics which distinguish that species from this; and as the two had been generally confounded and treated as the same until Murray separated them and described the leading points of each, we take pleasure in recording his decision here. The true *A. Jezoensis* of Siebold and Zuccarini forms a large sized tree, and produces a smooth, soft timber, which is useful for manufacturing into household utensils and is frequently employed for arrows, etc.

"This tree," say Siebold and Zuccarini, "which grows wild in the Islands of Jezo and Krafu, is cultivated as a rarity in the gardens of the wealthy, at Jeddo." In Sargent's edition of Downing's Landscape Gardening, the author says, "Our specimens, which are small, seem quite hardy," and it is to be desired that they may prove permanently so on a longer trial. This is the *Jezo-Matsu* of the Japanese, and resembles closely *A. Menziesii*.

13. *A. microsperma*, Lindley & Veitch.—Leaves, from $\frac{1}{2}$ to $1\frac{1}{4}$ inch in length, from $\frac{1}{2}$ to $\frac{3}{4}$ of a line in breadth, numerous, closely approximated, solitary, linear, sub-triangular. Cones, from $1\frac{1}{4}$ to $2\frac{1}{4}$ inches long, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in diameter, pale cinnamon color, with very persistent oblong scales, that are glabrous when exposed, and tomentose when not; bracts, small, rounded and serrated.

Seeds, very small, pale cinnamon colored, with a small, oblong, ovate wing.

Another new species closely allied to *A. Alcocquiana*, and found growing in the vicinity of Hakodadi, on the Island of Jesso. The only specimens seen were from 20 to 30 feet in height, but exceedingly beautiful; perhaps one of the finest of the genus. Its ultimate height is supposed to be about 40 or 50 feet, with very rough, pale branchlets, and longer leaves than those of *A. Alcocquiana*.

14. *A. polita*, Siebold & Zuccarini.—Syn. *Pinus Abies*, Thunberg; *Abies Torano*, Siebold in Verhandl.; *Pinus polita*, Antoine & Endlicher; *Picea polita*, Carriere.—Leaves, from 6 to 10 lines long, very persistent (for seven years), spirally alternate, not distichous, sessile, linear, rigid, glabrous, bright green, thick, slightly curved, with a somewhat sharp point, entire, tetragonal. Cones, from 4 to 5 inches long, 2 inches in diameter, elliptical, rounded at both ends, solitary, terminal, with obovate, or obovate-subrhomboidal, irregularly crenulated, coriaceous, glabrous, bright chestnut-colored scales; bracts, minute, linear-obtuse, entire, coriaceous, scarcely equalling in length the fourth part of the scale. Seeds, rather small, with a broad wing. (Murray).

According to Murray, "Siebold informs us that he saw this superb Fir for the first time during his journey to Jeddo, in the sacred groves around the temples of Miako. The form of its cones and the entire habit of the tree forcibly recalled to his mind the Common Spruce. At Jeddo he received branches of cultivated specimens, but he thinks it should be found wild in the mountains of Nikao. From other accounts it appears that it forms great forests on the high mountains which stretch along the frontiers of Dewa and Mutsu, all the way to the northern coast of Nippon, and, according to Japanese reports, it is likewise to be found in the Kurile Islands. It is also found wild on the peninsula of Korai, and Siebold obtained a

branch of a specimen introduced from thence to Japan under the name of *Tojosen Momi*, which signifies 'Fir of Korai.'"

§ 2.—**TSUGA**.—THE HEMLOCK SPRUCES.

The Hemlock Spruces have been placed by Carriere in a separate genus, *Tsuga*. The chief distinctions upon which his separation is made are the manner in which the anther cells open, which is transversely instead of longitudinally, the flat, somewhat two-ranked leaves, and the solitary, persistent, and drooping cones. It is more convenient in the present work, as well as more in accordance with our accepted botanical authorities, to make both *Tsuga* and *Picea* sections of *Abies*. The characters by which authors distinguish them as genera are employed here for sections, or sub-genera, and are given on page 156. The trees of this section are all of remarkably graceful habit, and their foliage presents a more light and feathery appearance than that of either the Spruces or the Firs. The general character of the trees, as well as that of the wood, is well represented in our native Hemlock Spruce, *Abies Canadensis*, which may be taken as the type of this sub-genus.

15. A. Brunoniana, Lindley.—INDIAN HEMLOCK SPRUCE.—Syn. *A. dumosa, Lambert*; *A. decidua, Wallich*; *A. cedroides, Griffith*; *Tsuga Brunoniana, Carriere*.—Leaves, mostly 1 inch long, straight, linear, flat, obtuse, deflexed on the margin, obsoletely denticulate towards the apex, light green above, and very silvery glaucous below. Branches and branchlets, very numerous, drooping, and slender. Cones, 1 inch long, oval, sessile and smooth; with orbicular, sessile, persistent scales, and emarginate, wedge-shaped, very short bracteoles. Seeds, small, wedge-shaped, ferruginous, with an oblong, obtuse, shining, membranaceous wing.

A very handsome and graceful tree from Sikkam, Nepal, and Bhotan, where it attains the height of 70 or 80 feet, and is found in the former locality growing at an elevation of from 9,000 to 10,000 feet, and in the latter from 6,500 to 9,500 feet; but although it is a native of such high altitudes, and is quite hardy in England, its success in this country is quite indifferent.

In Sargent's description, he says: "We are somewhat perplexed in making up our mind about the future condition of this charming tree as to its availability. If it succeed at all, it will certainly require a good deal of coaxing. Our own specimen has been very various. It has stood some winters well, and others, not as cold but possibly damper, seemed to have destroyed it." This has been the experience with almost all cultivators of whom we have inquired, so that its ultimate success is exceedingly doubtful; and we would therefore caution any one against undertaking its culture at the North, unless he would be willing to lose a few plants in the experiment. A few degrees further south will, we have no doubt, suit it. The Gardener's Monthly says that although Gordon may class it as "quite hardy and thus deceive American readers, it will be killed easily by 10° below freezing point, according to an American-made thermometer." We believe that, with proper protection and suitable soil, it will withstand a much lower temperature than the above.

The Indian Hemlock very much resembles the Common Hemlock (*A. Canadensis*) in general appearance, but in the former the under side of the leaves is of an elegant silvery-white color, so that, when disturbed by the wind, they create a curious yet beautiful effect. This tree is liable to the same disparagement as the *A. Menziesii*, in regard to its proneness to lose its leaves. Dr. Wallich says that "the slightest shake of the branch is sufficient to detach them." We have also noticed this trouble, even on very young plants.

The wood warps quite easily, and in consequence is rarely used by the natives. Loudon says "it was discovered by Captain Webb, and named *Brunoniana* by Dr. Wallich in honor of Mr. Brown."

16. A. Canadensis, Michaux.—HEMLOCK SPRUCE.—Syn. *Tsuga Canadensis, Carriere*.—Leaves, $\frac{1}{2}$ of an inch long, flat, obtuse, linear, dark green above, and glaucous below. Branches, horizontal, drooping, and numerous. Cones, $\frac{3}{4}$ of an inch long, greenish when young, changing to light brown with age, oval, with few scales; scales, roundish-oblong, entire. Seeds, quite small, with light colored wings.

The Hemlock Spruce is a native of the Northern States, extending from the Atlantic to the Pacific Ocean, and from the high mountains of North Carolina, in the South, to about the 51° N. latitude, near Hudson's Bay, in the North. It is emphatically a northern tree, withstanding the exposure and cold storms better than the hot summer suns of warmer climates. A sufficient proof of this is found in the fact that it becomes much rarer in the southern limits, and is there only found in the cooler temperatures of the northerly sides of high mountains in the Alleghanies, etc.

Throughout the southern portion of the Middle States this species is found generally along the larger streams and rivers, but according to Michaux this peculiarity is not by any means a settled rule; for in some sections where it is mingled with the Black Spruce it occurs less frequently, as the soil is more humid.

Throughout our most northern border and in the British Possessions, the Hemlock Spruce forms vast forests, stretching for hundreds of miles, and is frequently unassociated with any other species, but occasionally may be found in company with the Black Spruce, White Pine, and other trees. Nuttall mentions that it was collected by Dr. Scouler on the north-west coast of America, and was also



Fig. 23.—*ABIES CANADENSIS*, ONE-HALF THE NATURAL SIZE.

observed by Dr. Tolmie, as far north along that coast as Milbank Sound and Stikine. It is also common in the pine forests around Vancouver, and along the high banks of the Wahlamet and the Oregon.

In favorable situations this spruce forms a tall tree of about 70 or 80 feet in height, and is frequently clothed with branches nearly to the ground; but in the thick clumps and masses, as well as in the vast forests, it runs up a tall, clean trunk that is mostly destitute of limbs for a considerable distance. The old trees, however, are liable to a disease which causes the lower branches to gradually die away, and thereby destroy the symmetry of the tree; but to the younger plants no objection that we are aware of can be made. The regular, conical form, tapering from a broad base evenly to a long, straight, and thrifty leading shoot, is the common shape of the tree.

The long, slender branches, drooping gracefully to the ground, present so beautiful a picture, that it is indeed difficult to surpass it, and when we compare the rich, dark green foliage of a healthy plant that is varied so exquisitely with the marked glaucousness of the under side of the leaves, we must admire a tree which presents such a diversity of charms. We have often lingered admiringly in the contemplation of a group of these trees, watching the play of light and shade as it increased or diminished through their verdure, and mentally compared these claims on our notice with the rarer introductions from abroad; and such meditations invariably resulted in the same conclusion, that, so long as they were *common*, (an American term for native trees), men of more means than taste would prefer the latter class. If such will it, let them enjoy their preference, but so far as we are concerned, were we restricted to one tree, we would far rather have a fine specimen of the Hemlock Spruce, than all the Deodars and Cryptomerias ever introduced.

Meehan, in his admirable little book on Ornamental

Trees, remarks of the Hemlock: "It would not be exaggeration to pronounce this the most beautiful evergreen in cultivation. Beautiful as many of the new pines are, few approach this. It has regularity without formality, and, in any point of view, elegance and gracefulness. Its habit is frequently so erect as to approach the fastigate; yet the ends of its branches are as pendulous as a Babylonian Willow. Its color is not of that mournful cast so common to other Pinaceæ, nor of that consumptive looking hue so connected with sickliness. Stepping between these it is suggestive of innocence and lightness, which cannot fail to attract admirers for it in whatever situation it is placed. It will make the prettiest object when grown by itself, but it is a tree that has no aversion to company."

Many cultivators have an idea that it is exceedingly difficult to remove, and on this account have neglected it; but frequent practice for many years has assured us that no Conifer, taken from the nursery row or from cultivated grounds, will better sustain a removal than the one we are now describing.

It is true that young plants carelessly dug in their native haunts, that are most likely partially or wholly shaded, and unprovided with a sufficient supply of delicate fibrous roots, will almost certainly refuse to live; but if small seedlings about one foot high be selected and carefully taken up and removed to a light mellow piece of ground that is shaded naturally, or by artificial means, success will be the result.

A great mistake is continually being made by planting the Hemlock in dry situations; for while it cannot thrive in wet and swampy ground, it greatly prefers a rather moist, deep, loamy soil and cool location, the better if partially shaded. In such spots the beauty of the foliage and luxuriant growth speedily develop themselves in the highest degree.

According to Michaux, the value of the Hemlock tim-

ber is less than that of any other American resinous tree; but since his time the immense quantity that has been annually consumed over our country is a sufficient proof of its popularity for rough work. Although extremely perishable and coarse-grained in texture, it enters largely into the construction of our buildings, furnishing a cheap quality of lumber for the unimportant portions that are preserved from the action of the weather. It is a source of regret, however, that a tree so universally scattered over the timber sections of our country, and in such immense quantities, could not have been of better quality. A redeeming quality, nevertheless, is contained in the bark, which is of great importance for tanning. It is asserted that although inferior to oak, a mixture of the two is much superior to either when used separately.

As a screen the Hemlock Spruce is greatly admired, and as it bears the shears well, grows thriftily, is of a dark green color, and very dense, it will increase in the estimation of planters as its availability for this purpose becomes more fully known.

Michaux mentions a peculiarity in this species of sometimes ceasing to grow at the height of 24 or 30 inches, in which state it has a conical form, and its compact, tufted branches rest upon the ground. We have observed this curious variety in our own collection, and have deemed it of sufficient importance to perpetuate.

Var. nana, Lawson.—Is mentioned by Gordon in his *Pinetum* as “not growing more than two or three feet high, and spreading on the ground with a more tufty foliage.” It is probably not distinct from the numerous chance sports just mentioned.

Var. microphylla, Lindley.—The Gardener’s Chronicle describes this as follows: “Messrs. Fisher & Co. raised it from seed imported from Canada, and they have found it much more hardy than *Canadensis* itself, it not having

suffered in the severe winters two years ago, when so many Conifers were injured. It is an *Abies* of such singularly dwarf habit that it might almost be compared with a Heath; leaves, very dark green, with a white streak beneath, rough at the edge, and no bigger than those of *Menziesia polifolia*."

17. *A. Douglasii*, Lindley.—DOUGLAS' SPRUCE.—Syn. *Tsuga Douglasii*, *Carriere*.—Leaves, from 1 to $1\frac{1}{2}$ inches long, linear, obtuse, flat, quite entire, dark green above, silvery glaucous below. Branches, horizontal, drooping, with light brown bark. Cones, from 2 to 3 or 4 inches long, ovate-oblong, light brown; bracts, numerous at the base; scales, thin, smooth, entire, round, coriaceous, persistent; bracteoles, linear, membranaceous, twice as long as the scales, with acuminate teeth. Seeds, small, oval, with a crustaceous testa, and a short, elliptic, obtuse wing.

This splendid Conifer was first discovered by Menzies in the year 1797, at Nootka Sound, during the voyage of Vancouver, and from the specimens then procured the name of *Pinus taxifolia* was given it by Lambert. This specific name, however, now belongs to a beautiful variety of it that will be mentioned hereafter. It was subsequently found by Douglas, who determined its true character, and in whose honor it has been named.

Throughout northwestern America, and principally along the coast from the latitude of 43° to 52° , it constitutes the greater portion of the heavily wooded timber; and according to Nuttall it extends into the valleys of the Rocky Mountains eastward to the upper waters of the Platte and the Blue Mountains of Oregon.

The size of some of these trees is immense. Douglas records their height at from 100 to 180 feet, and from 2 to 10 feet in diameter; one of these prostrate stumps at Fort George on the Columbia measured 48 feet in circumference at 3 feet from the ground, and 150 feet still remained without any branches. It is supposed that the immense

trees found by the explorers Lewis and Clarke were of this species, some of which actually measured 300 feet in height. According to most writers, however, they vary from 150 to 200 feet in height. As the summits of the mountains are neared, this species becomes a mere bush of only a few feet in height. Dr. Parry, who recently explored Pike's Peak and other haunts of this tree, thus alludes to it: "Abundant through the eastern mountain district, except on the higher elevations. A very sightly tree of the average height of 80 feet, with a graceful, oval outline; the spreading branches curving upwards at the extremities."

In Downing's description of the pinetum at Dropmore, he says: "The oldest and finest portion of the pinetum occupies a lawn of several acres near the house, upon which are assembled, like belles at a levee, many of those loveliest of evergreens—the *Araucaria*, or Pine of Chili, the Douglas Fir of California, the sacred Cedar of India, the Funereal Cypress of Japan, and many others.

"Perhaps the finest tree in this scene is the Douglas Fir, (*Abies Douglasii*). It is 62 feet high, and has grown to this altitude in 21 years from the seed. It resembles most the Norway Spruce, as one occasionally sees the finest form of that tree, having that graceful, downward sweep of the branches, and feathering out quite down to the turf, but it is altogether more airy in form, and of a richer and darker green in color. At this size it is the symbol of stately elegance."

Having been intimately acquainted with this tree for a number of years and observed it closely, we unhesitatingly place it upon the list of available ornamental trees, with certain restrictions; and these are the same we have frequently recurred to in our remarks on other Rocky Mountain plants. We consider it superior in hardiness to the *A. Smithiana*, and much less susceptible of scorching by the action of the sun's rays.

The beautiful specimen in the collection of the late John Evans, at Radnor, near Philadelphia, is now 25 feet or upwards in height, makes a vigorous annual growth, and with the exception of losing a portion of its leader in an unusually severe winter a few years ago, has remained entirely uninjured.

This fine specimen stands on a gentle declivity facing the south-west, and is growing in a light gravelly subsoil that has proven too dry for some others of the Coniferæ.

The experience of cultivators in different sections of our country has been so varied and so opposite in character as to lead those interested in the success of this tree to inquire into this apparent contradiction; and in every case where we have been enabled to ascertain correctly, the fault appears, not to have been in a few degrees further north or south, but to be in reality attributable to the nature of the soil and location. We therefore enjoin it upon planters to select a cool, open, porous subsoil that is not too rich, and endeavor to obtain a slight protection from the northerly winds. Sargent's views on this point so exactly coincide with our own, that we present them here: "Plants with us in low, damp ground, suffer occasionally in color, if not in loss of leader; whilst those grown in the shade, or on an exposed hillside, in poor, slaty soil, succeed admirably."

Nuttall remarks on the quality of the timber of this species, that it is heavy and firm, with few knots, about as yellow as that of the Yew, and not liable to warp, which is quite different from the account given of it by Dr. Parry. The latter says: "Wood of slow growth, but very indifferent, inclined to warp and crack, turning reddish-brown in drying."

Var. *taxifolia*, Loudon. — Syn. *Tsuga Lindleyana, Roetzl.* — This is a Mexican variety found on the Real del Monte Mountains at an elevation of from 8,000 to 9,000 feet. It is also occasionally met with in portions of Oregon,

and is perhaps the plant first discovered by Menzies. It is quite distinct from the species, being smaller in size, with longer and darker leaves, and with broader, shorter, and less pointed scales; the bracts also more contracted.

Var. fastigiata, Knight.—Differs from the species in being more compact and conical in shape, and with ascending branches.

Var. Standishiana, Gordon.—In the supplement to Gordon's Pinetum, this new variety is described at some length as very distinct and desirable, having large, dark, glossy green foliage, quite silvery below, but with the habit and general outline of *A. Douglasii*. It originated in Standish's Nursery, at Bagshot, and is not yet introduced into our collections.

NEW SPECIES OF HEMLOCK SPRUCE.

18. A. Mertensiana, Lindley.—CALIFORNIAN HEMLOCK SPRUCE.—Syn. *A. heterophylla, Rafinesque*; *A. taxifolia, Jeffrey*; *Tsuga Mertensiana, Carriere*.—Leaves, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long, flat, obtuse, crowded, bright green above, slightly glaucous below. Branches and branchlets, slender, drooping, and very numerous. Cones, $\frac{3}{4}$ of an inch long, ovate, with few, persistent, reniform, entire scales, and small, pale brown seeds, with a short ovate wing.

This new species was first named and described by Bongard, the Russian botanist, who bestowed upon it the title of *Pinus Mertensiana*, and gave Sitka as its locality. It is found, however, in different parts of northern California and Oregon, constituting, according to some writers, one-half the timber in the neighborhood.

Its height is from 100 to 150 feet, and unlike the common Hemlock Spruce it forms a roundish-conical head;

it is also very dense and compact in growth, and remarkably graceful in the arrangement of its branches. The main body of the tree is usually straight, with a gradual tapering upwards, and covered with a smoothish, thin bark.

We have hopes of being able to acclimate this species, the section of country from which it comes being such as to warrant the belief that it will be hardy. In England it is represented as being "entirely hardy, and very much resembling in general appearance the Hemlock Spruce."

Some late English writers have confounded it with the following species, *A. Williamsonii*, but it is very distinct from this in many leading characters. Timber, white, soft, and almost devoid of turpentine.

19. A. Tsuga, Siebold & Zuccarini.—Syn. *Pinus Tsuga, Antoine & Endlicher*; *Tsuga Tsuga, Murray*; *T. Sieboldii, Carriere*.—Leaves, from 6 to 10 inches long, persistent, approximated, alternate, sub-distichous, linear, emarginate, obtuse, or rarely acute, smooth, coriaceous, dark green above, with a white line on each side of the midrib below. Cones, scarcely 1 inch long, elliptic, or sub-elliptical, solitary, terminal, obtuse, quite persistent; with coriaceous, imbricated, pale brown scales; bracts, truncate, rather broad, irregularly bifid, closely appressed. Seeds, small, ovato-rhomboidal, somewhat compressed, with a pale, ferruginous, membranaceous wing.

A small Spruce, rarely exceeding 20 or 30 feet in height, and reminding one of a small Hemlock Spruce, both in habit and general outline, and in fact they are nearly allied. There also exists a close relation between it and *A. Brunoniana*.

It has a very erect trunk, with a dark brown bark, and numerous, pale, slender branchlets.

This new Spruce is found in the northern provinces of Japan, in the mountainous parts of Mutsu and Dewa, but is quite rare; Siebold only noticing it in the gardens and shrubberies surrounding the temples. The wood is yellow-

ish-brown, and is manufactured into various household utensils.

Var. nana, Siebold.—Has much smaller leaves than the species and does not exceed 2 or 3 feet in height, and is frequently grown in pots by the Japanese.

20. A. Hookeriana, Murray.—HOOKER'S HEMLOCK SPRUCE.—Syn. *A. Williamsonii*, *Newberry*; *Abies Mertensiana*, *English authors*; *Picea Williamsonii*, *Engelmann*.—A tree of large size and alpine habit; leaves, short, acute, compressed, with a lenticular section. Cones, pendent, long, ovoid, acute, $1\frac{1}{2}$ inches long, purple when young; when old, cylindrical or somewhat conical, with a flattened base; scales, rounded, entire, large in old cones, strongly reflexed, except at the base of the cones; seeds, small, ovoid, black; wing entire, elliptical, pellucid; male flowers, in small, nearly spheroidal heads. (*Newberry*.)

From the Cascade Mountains, Oregon.

Lawson, in his new work on the Coniferæ, considers this and *A. Williamsonii* the same, and gives his reasons at some length.

We take great pleasure in recommending this rare and new Conifer to the notice of cultivators, believing, as it comes from the same section of country as many others of our hardy plants, it will most likely prove a success. According to Dr. Newberry, it is an alpine species, growing near the region of perpetual snow, and one of the finest of the genus. It has an irregular, spreading, and remarkably graceful habit.

21. A. Albertiana, Murray.—Syn. *A. Bridgei*, *Kellogg*.—This was described in the Proceedings of the Acad. of Nat. Sci. of California by Kellogg, but Murray's name has the priority by some two years. From Fort Langley, and closely allied to *A. Canadensis*. A tree 80 to 100 feet in height, of dark verdure and graceful appearance; the branchlets are very hairy, slender, and drooping. Abundant on both north and south bank of Fraser

River. The timber is firmer, finer, and straighter-grained than the Canadian Hemlock Spruce, which it represents on the Pacific Coast. The fruit is remarkably abundant; a specimen 8 inches long had 60 cones.



§ 3.—PICEA.—FIR.

The Firs are found in Europe, Asia, and North America, extending from the torrid to the frigid zone, but greatly preponderating in the latter. Some of the finest specimens are found on our north-west coast, and are represented by travellers as being of enormous proportions. *A. bracteata*, *A. nobilis*, *A. amabilis*, and *A. grandis*, are all magnificent trees, averaging from 150 to 200 feet in height. Mexico is well represented by *A. religiosa*, an elegant Conifer growing 150 feet high; and Europe, although possessing no such gigantic species, furnishes *A. Nordmanniana*, *A. pectinata*, and *A. Pindrow*, which are often found 100 feet high or over.

The Firs are remarkable for a perfect and formal, conical growth, furnished with branches to the ground, and terminating at the apex in a straight, strong, leading shoot; thus whilst they present a form perfect in its outline, rich in color, and vigorous in growth, it must be confessed is by no means so graceful as the Spruce, or so charming as the Pine. On hills, rocky prominences, or rugged valleys, where a picturesque effect is to be introduced, they are of the greatest importance; but on smooth, plain lawns, or tame, highly cultivated landscapes, they should be very sparingly and judiciously introduced.

The timber of most of the species is of but secondary importance, but the resinous products of the greater portion are very abundant and valuable. In the classifica-

tion of this sub-genus we have adopted the plan pursued by Endlicher and Gordon, of dividing it into two distinct groups, viz.: *Bracteata*, and *Brevibracteata*; the former with the bracts projecting beyond the scales, and the latter having them enclosed or shorter than the scales.



GROUP I.—BRACTEATA.

22. A. Apollinis, Link.—APOLLO SILVER FIR.—Syn. *Picea Apollinis, Rauch*; *A. Reginæ Amaliæ, Heldreich*, etc.—Leaves, from $\frac{1}{2}$ to 1 inch in length, linear, flat and obtuse, or lanceolate and acute, larger leaves slightly glaucous beneath, smaller ones quite glaucous below, the former on the adult branches very numerous, whilst the latter on the young branchlets are more scattered and much narrower. Male catkins in groups, surrounding the summits of the adult, sessile shoots. Cones, axillary, solitary, erect, very resinous on the surface, and similar to those of *A. Cephalonica* in size and shape; scales, 1 inch or more wide, incurved, and rounded on the upper margin; bracts projecting beyond the scales, ear-shaped, flat, reflexed, mucronate, and lacerated laterally on the edges, and with a long, central, reflected point. (*Extracted from Gordon's description.*)

This Silver Fir, which was described by Gordon in his first edition of the Pinetum, as a synonym of *Picea Cephalonica*, has been in his supplement to the work assigned to the position of a species, but we are fearful, without sufficient grounds. The fructification, which is usually the most unerring guide in determining these questions, is so nearly alike in the two, as to be scarcely distinguishable, if at all; and in young plants that have fallen under our own observation, no distinction could be perceived.

As the plants increase in age and present a more mature aspect, the case may be different, and the differences be-

come more apparent; we therefore yield to the judgment of such authorities as Link, Antoine, and Rauch, and like Gordon have given it a specific description, although subsequent observation may cause us to differ from them.

It is a native of Greece, where it is found growing on the mountains at different elevations, from 1,500 to 4,000 feet, and forming a tree from 60 to 70 feet in height. Young plants in our grounds have proven hardy, and as they resemble *A. Cephalonica*, are equally handsome. We feel no hesitation in recommending it for trial.

23. *A. balsamea*, Marshall.—BALSAM FIR, OR BALM OF GILEAD FIR.—Syn. *Picea balsamea*, *Loudon*.—Leaves, from $\frac{3}{4}$ to 1 inch long, narrowly linear, spreading, slightly recurved, flat, dark green above, and silvery glaucous beneath. Branches, horizontal and numerous, with a smooth bark, abounding in resinous vesicles. Cones, 3 to 4 inches long, cylindrical, violet colored; scales, broad, thin, rounded, smooth; and obovate, mucronate, serrulate bracts. Seeds, small and angular.

The Balsam Fir was first described by Humphry Marshall, the pioneer in American botanical authorship, in his work entitled *Arbustum Americanum*. The habitat of this species, according to Gray, is in cold, damp woods and swamps, New England to Pennsylvania, Wisconsin and northward. It is also a native of Canada, Nova Scotia, etc., where it is very abundant.

This Fir has been frequently confounded with the *A. Fraseri*, especially as the description given by Michaux of *A. balsamifera* belongs to *A. Fraseri*. The two are quite distinct in their cones, and especially so in the bracts, but otherwise are much alike.

The Balsam Fir generally grows about 30 or 40 feet in height, and forms, when young, a compact, conical tree of regular outline and rapid growth. It has been so long a popular ornamental tree in many parts of this country, that it appears like turning our backs upon an old friend



Fig. 24.—*ABIES BALSAMEA*, TWO-THIRDS THE NATURAL SIZE.

to denounce it; but there are so many better species to substitute in its place, that we can part with it without regret. For the first few years it is a model of beauty in color and form, but as it nears maturity, and often before, the lower limbs commence to decay, and thus the beauty and symmetry of the tree are forever destroyed.

Notwithstanding all that has been said upon the subject, and the advice from all well-intentioned dealers who are aware of its peculiarities, together with facts staring them everywhere in the face, a large majority of purchasers request this tree of the nurseryman in advance of any other, and so long as there is a demand, it will continue to be grown. We have always been sorry that the late A. J. Downing commended it so highly in his *Landscape Gardening*.

A very aromatic liquid resin is obtained from this tree by incisions made in the bark, and is called, very incorrectly, "Balm of Gilead," the name "Canada Balsam" being much more appropriate. The wood is light, yellowish, and slightly resinous. This species was introduced into England as early as the year 1697, by Bishop Compton.

Var. longifolia, Booth.—"Has leaves longer than the sheaths, with the branches somewhat more upright.—(*Loudon.*)

Var. variegata, Knight.—Has yellowish leaves intermixed with the usual color; otherwise as the species.

24. A. bracteata, Hooker.—LEAFY-BRACTED SILVER FIR.—Syn. *Picea bracteata, Loudon.*—Leaves, 2 to 3 inches long, linear, entire, crowded in two rows, flat, coriaceous, rigid, light shining green above, silvery glaucous below. Branches, in whorls, spreading, slender; lower ones, decumbent. Cones, 4 inches long, 2 inches in diameter, ovate, on short peduncles, turgid, solitary, lateral, with roundish, reniform, concave, crenulate, acute, persistent scales; bracts, wedge-shaped, rigid, coriaceous, trilobed at apex, lateral lobes irregularly dentate, short and round-

ish, middle segment 2 inches long and recurved, varying but little from ordinary leaves. Seeds, oblong, wedge-shaped, tetragonal, with a grayish-brown testa, and very short, thinly membranaceous, flat, reticulated, entire wings.

This species was discovered by Douglas in Oregon growing on the higher mountains, and was afterward found by Dr. Coulter on the sea-side mountain range of Santa Lucia, in latitude 36° , and according to his authority is about 120 feet in height and 2 feet in diameter, with a trunk as straight as an arrow.

The very curious and remarkable cones borne by this tree are handsomely fringed by long, leaf-like bracts, that are entirely different from those belonging to any other species. The foliage is quite long and of a beautiful bright green color, which finely contrasts with the glaucousness of the under side, and the whole form of the tree is unexceptionable. Frequently but one-third of the body is clothed with branches.

Douglas, in his description of the species, remarks: "When on the tree, being in great clusters, and at a great height withal, the cones resemble the inflorescence of a *Banksia*, a name I should like to give this species, but that there is a *P. Banksii* already. This tree attains a great size and height, and is on the whole a most beautiful object. It is never seen at a much lower elevation than 6,000 feet above the level of the sea, in lat. 36° , where it is not common."

Not knowing of any specimen of the *A. bracteata* in cultivation in this country, we are of course unable to speak of its adaptation to our climate; but Gordon says in England: "It is *quite hardy*, but suffers very much in its young growth from late spring frosts." If that indicates a quite hardy tree, then we greatly mistake the meaning of the term; as to its succeeding with us, we have our doubts, however we may desire it to do so.

25. A. Cephalonica, Loudon.—CEPHALONIAN SILVER FIR.
—Syn. *Picea Cephalonica, Loudon.*—Leaves, $\frac{3}{4}$ of an inch or more in length, dagger-shaped, almost sessile, numerous, equally distributed, sharply mucronate, dark green and shining above, glaucous below. Branches, numerous, horizontal, and spreading, with bright brown bark and resinous buds. Cones, from 5 to 6 inches in length, cylindrical, straight, with broad, entire scales; bracts, linear-oblong, with unequally toothed, rigid, and reflexed sharp points at the apex.

This very beautiful Fir is a native of Mt. Enos, the highest mountain of Cephalonia, as well as of several parts of Greece. On the former locality it is found at an elevation of from 4,000 to 6,000 feet, growing 60 feet high, with a broad, spreading head, the body measuring 9 or 10 feet in circumference. It was first introduced into England by General Napier, Governor of Cephalonia, who, being much interested in its culture, sent home seeds which have produced some splendid specimens. It has in England proved entirely hardy, and in every way perfectly satisfactory.

We are exceedingly partial to this tree, not only on account of its hardness with us, but for its dark green, unique looking foliage, standing out in every direction like miniature bayonets, as if to guard the tree from all invaders; and such an office it is well capable of performing, for its exceedingly sharp points repel all attempts at familiarity.

In light soils, as well as in those of a tenacious clayey loam, we have seen specimens that would rival the *Araucaria* in beauty. One of the finest specimens we have ever seen is growing in the collection at Wodenethe, on the Hudson, the height of which we should judge to be 20 feet; others are 10 and 12 feet high, and although younger, are equally beautiful and healthy.

All with whom we have conversed agree as to its hardness, although in Meehan's little treatise he speaks of

the young plants being liable to lose their terminal buds in excessively cold weather, and recommends tying a little cotton around the main shoot to protect it. We have never experienced any ill effects from this cause, although our plants, even at the age of three and four years, have been left in the open air.

Loudon remarks of the wood: "The timber of this tree is said to be very hard and of great durability. General Napier informs us that in pulling down some old houses in the town of Argostoli, which had been built from 150 to 300 years before, all the wood-work of Black Forest fir was as hard as oak, and perfectly sound."

26. A. Fraseri, Pursh.—FRASER'S BALSAM FIR.—Syn. *Picea Fraseri*, Loudon; *A. balsamifera*, Michaux. — Leaves closely resemble those of *A. balsamea*; "cones, 1 to 2 inches long, oblong-ovate; bracts, oblong-wedge-shaped, short pointed, the upper part much projecting and reflexed." (Gray.)

This species, according to Gray, inhabits the "mountains of Virginia, Pennsylvania, and southward on the highest Alleghanies. Also on the mountains of W. New England." It is quite a small tree, scarcely ever exceeding 20 feet in height, and is generally distinguished from *A. balsamea* by its shorter, denser, and more erect foliage, as well as the very compact shape and numerous small branchlets. Nuttall says "it was discovered on the high mountains of Carolina by Fraser, and on the Broad Mountain in Pennsylvania, by Mr. Pursh, who first described it."

As an ornamental tree this can never occupy a prominent place, being liable to the same defects as those heretofore noticed in our description of the Common Balsam Fir. It is also smaller and less beautiful in form, although the specimens that have fallen under our notice may not have been fair examples as to shape and general character.

The Evans specimen is about 10 feet high, and is grow-

ing in the edge of a wood where the plant has been much shaded; a more open and better locality might have produced different results. Its hardness is beyond a doubt.

Var. Hudsonica, Knight.—Is a very pretty dwarf plant that will perhaps not exceed four feet in height, although we have seen a specimen 15 years planted that has attained the above size, and is still vigorous and increasing.

It is remarkably dense and compact, and of a beautiful deep green color, agreeably diversified with the glaucousness of the under side of the leaves. It was discovered in the vicinity of Hudson's Bay. We take great pleasure in directing attention to this little variety, believing it will meet the wants of our planters in general.

27. A. nobilis, Lindley.—NOBLE SILVER FIR.—Syn. *Picea nobilis, Loudon*; *Pinus nobilis, Douglas*.—Leaves, $1\frac{3}{4}$ inches long, linear, falcate, mostly acute, crowded, compressed, deep green above, glaucous below. Branches, horizontal, spreading, and numerous. Cones, from 6 to 7 inches long, and from 8 to 9 inches in circumference, cylindrical, sessile, with large, incurved, stipulate, and entire scales; bracts, large, reflexed, imbricated, spathulate, with terminal, awl-shaped points. Seeds, oblong, with a coriaceous testa, and broad, pale colored wings.

The Noble Silver Fir, as its specific name implies, is one of the most magnificent productions of our hemisphere. Douglas says of it: "This singular species is a majestic tree, forming vast forests on the mountains of Northern California, and produces timber of an excellent quality." He adds: "I spent three weeks in a forest composed of this tree, and day by day could not cease to admire it."

Along the banks of the Columbia River, and on the mountains of Northern California, as well as other localities on our northwestern coast, these trees flourish and grow to an immense size. Jeffrey mentions finding specimens 200 feet in height and four feet in diameter, growing on the Shasta Mountains at an elevation of from 6,000

to 8,000 feet. In allusion to its immense size, the Indians have given it the name of "Tuc-tuc," which means literally "the Big Tree."

The high prices charged for the majority of these rare Conifers is probably the reason that we so seldom meet with them in cultivation. Therefore, with the exception of a few of the more enthusiastic cultivators, the *A. nobilis*, with other kindred species, is almost entirely unknown. But when their merits become more fully understood by our intelligent planters, they will certainly stand high in their esteem. The species we are now describing is apparently quite hardy, but we should advise planters to give the young plants a slight protection during winter.

In a letter from the lamented Downing to the Horticulturist a few years since, he thus mentions a splendid specimen of the *Abies nobilis* growing in the arboretum at Chatsworth: "But the two most striking and superb trees, which I nowhere else saw half so large and in such perfection, were Douglas' Fir (*A. Douglasii*), and the Noble Fir (*A. nobilis*). They are two of the magnificent evergreens of California and Oregon, discovered by Douglas, and brought to England about 18 years ago. These two specimens are now about 35 feet high, extremely elegant in their proportions, as well as beautiful in shape and color."

Another recent writer thus eloquently speaks of this tree: "Its ivy-colored, dark shining green leaves, with horizontal, outspreading branches, each tier forming complete platforms around the tree, with a surface almost as level as Utrecht velvet, never fails to put the stranger into a state of amazement to contemplate such a wonderful arrangement of beauty, elegance, and perfection." According to Lambert, this species is nearly related to *A. Fraseri*, but has cones five times as large.

28. *A. Nordmanniana*, Link.—NORDMANN'S FIR.—Syn.

Pinus Nordmanniana, *Steven*; *Picea Nordmanniana*, *Loudon*.—Leaves, 1 inch long, linear, flat, incurved, dark green above, and glaucous below. Branches, numerous and horizontal, with a smooth bark. Cones, 5 inches long, pedunculate, ovate; with large, obtuse, closely appressed, entire, recurved scales; and short, mostly cordate bracts, ending in a recurved point. Seeds, soft and triangular, with an obliquely expanded, membranaceous wing.

This desirable Fir was first discovered by Prof. Nordmann on the Adshar Mountains, at an elevation of 6,000 feet, and growing from 80 to 100 feet high, with a straight stem. It is quite abundant on the Crimean Mountains, and those east of the Black Sea; and “on the southern declivity of the mountains between Cartalin and Achalzich, as far up as the alpine regions, growing amongst a forest of *Abies Orientalis*.”

Our experience with this species has been so very satisfactory that we wish it were better known. The most severe winters have never affected it in the least, and it appears always to retain the beautiful green color of its foliage in all seasons and through all vicissitudes. It is quite vigorous in growth, beautiful in verdure, regular and graceful in form, of large size, and perfectly hardy in this latitude. What success those living in a less temperate climate than our own may have with this species, we are at present unable to say; but, judging from our own specimens, we infer it would thrive still farther north.

29. *A. pectinata*, *De Candolle*.—EUROPEAN, OR COMMON SILVER FIR.—Syn. *A. Picea*, *Lindley*; *Picea pectinata*, *Loudon*; *Pinus Picea*, *Willdenow*.—Leaves, from $\frac{1}{2}$ to 1 inch long, linear, obtuse, occasionally acute with the point incurved, rigid, deep shining green above, glaucous below. Branches, horizontal and in whorls. Cones, from 6 to 8 inches long, cylindrical, axillary, green when young, then changing to red, and brown at maturity; scales, rather large, thin, rounded; bracts, long, and tipped with an acute point. Seeds, more or less angular, very resinous, with a broad, membranaceous wing. Cotyledons, 5.

A well-known species that was introduced into this country several years ago. It is from the principal mountain ranges of Middle and Northern Europe, but is found more plentifully upon the Alps, extending their entire length from east to west, at an elevation of from 2,000 to 4,500 feet. In favorable situations it forms a large-sized tree about 100 feet high, although, according to Loudon, it will grow from 160 to 180 feet; as it is a rapid grower, the tree soon arrives at maturity.

We cannot recommend it for general cultivation for several reasons. In the first place, young plants remove very badly, and are frequently three and four years in recovering from the change of location; severe winters generally affect the foliage and occasionally destroy a portion of the branches, particularly the main shoot; they require a deep, rich soil to perfect their greatest beauty, and in such are liable to be injured by a strong, luxuriant, unripened growth; and at best, the tree is exceedingly formal and devoid of the graceful habit that is so frequently associated with the Coniferæ. If anything more be needed to blast its reputation, we might also add it is very short-lived and impatient of drought.

On the other hand, when fully established in a suitable soil and location where it is protected from the strong winds, this tree forms a rapid-growing specimen, with deep, shining green foliage and quite striking in character; and although we never could appreciate the remarkable beauties that some authors have seen in old trees of this species, we confess a healthy, vigorous, and dense-growing young plant involuntarily excites admiration from almost every one. Some of the finest specimens in this country are at the Bartram gardens near Philadelphia; in Peirce's arboretum in this neighborhood; and in the vicinity of Germantown, Pa.

A writer in the *Gardener's Monthly*, says: "The Balsam Firs mentioned in Downing's *Landscape Gardening*, grow-

ing on the grounds of the late Geo. Sheaff, Esq., at White Marsh, Montgomery Co., Pa., is a mistake; those handsome Balsams are unusually fine specimens of the *Picea pectinata*, and have made a growth of near 80 feet in about 30 years."

Loudon commences his description of this species as follows: "The Silver Fir, the *noblest* tree of its genus, except *P. Webbiana*," etc.; thus ignoring the more noble dimensions of our north-west species, which are unapproachable in size and beauty. Whilst the *Abies pectinata* rarely, if ever, exceeds 180 feet in height, such American Firs as the *A. nobilis*, *A. grandis*, and *A. amabilis*, reach an altitude of from 200 to 250 feet; and Jeffrey states that he saw specimens of *A. grandis* 280 feet in height.

The Silver Fir produces a white wood, elastic and hard, with an irregular grain. The Strasburg turpentine is extracted from tumors found on the bark of this tree, and according to the ancient writers was valued in their day.

As is the case with all our well-known cultivated trees that have a wide range, this Fir has a large number of varieties. We select a few of the most distinct, although possibly not very desirable in other than large collections.

Var. pendula, Godefroy.—Is a peculiar plant, as hardy as the species, but not very handsome. A specimen in our collection reminds one of an unmanageable tree of the Winter Nelis Pear.

Var. tortuosa, Booth.—Is only curious, the branches being twisted and deformed.

Var. pyramidalis, Hort.—This peculiar tree is described as having its branches curved upward, but with the ends more or less drooping. The general outline resembles somewhat that of the Lombardy Poplar. From Germany

Var. variegata, Hort.—Has numerous pale yellowish leaves intermingled with the usual green foliage.

Var. fastigiata, Booth.—A French kind with the

branches all erect, although somewhat like *var. pyramidalis* in its general outline, but with branchlets more slender and compressed, and with small, slender, and frequently incurved leaves.

Var. nana, Knight.—According to Gordon this is a very dwarf variety, growing one or two feet high, and smaller in all its parts. Of French origin, and probably the *var. cinerea*, of Baumann, and mentioned by Loudon.

30. A. religiosa, Lindley.—SACRED SILVER FIR.—Syn. *A. hirtella, Lindley*; *Picea hirtella* & *P. religiosa, Loudon*; *Pinus hirtella* & *P. religiosa, Humboldt*.—Leaves, from 1 to 1½ inch long, linear, entire, obtuse, coriaceous, distichous, dark green above, silvery glaucous below. Branches, when young, hirsute, but smooth and covered with a brown bark when old, slender. Cones 5 inches long, roundish-oval, obtuse, pedunculate; with large, entire, lamelliform, cordate, acute scales; and broad, reflexed, serrated, membranaceous bracts. Seeds, rather large, irregular, and wedge-shaped, with a thinly membranaceous, transparent wing.

This beautiful Silver Fir is a native of Mexico, and is found on several of the colder altitudes of the mountains in that country. Loudon says: "This is a tall and elegant tree found by Humboldt on the lower hills of Mexico, between Masantla and Chilpantzingo, at an elevation of 4,000 feet. Deppe and Schiede found it upon the cold mountains of Orizaba, at the highest limit of arborescent vegetation. The leaves are larger, and the branches more slender than those of any other of the Silver Fir tribe; and they are used by the Mexicans for adorning their churches."

The Sacred Silver Fir is peculiarly handsome in foliage, with long, slender, drooping branches, and of immense size. A plant in our own collection fully endorses the character given it in this respect, but it has not been tested in the open air. As we have no accounts from oth-

ers who have tried it, we are at present unprepared to class it among our hardy plants; and we greatly fear it will not succeed, although it comes from high altitudes.

GROUP II.—BREVIBRACTEATA.

31. *A. amabilis*, Lindley.—LOVELY SILVER FIR.—Syn. *Abies lasiocarpa*, Lindley; *Pinus amabilis*, Douglas; *Picea amabilis*, Loudon.—Leaves, 1 to $1\frac{1}{4}$ inch long, linear, flat, obtuse, crowded, entire, incurved, light green above, glaucous below. Branches, numerous, horizontal, and spreading. Cones, 6 inches long and $2\frac{1}{2}$ inch in diameter, cylindrical; with round, entire, smooth scales, and very short, pointed bracts. Seeds soft and angular, with a membranaceous wing.

This lovely tree is one of the most desirable Conifers from our northwestern coast. It was discovered by Douglas, and subsequently found by Jeffrey growing on the mountains at an elevation of 4,000 feet, and forming gigantic specimens 250 feet in height, when in gravelly soil. The trunks were frequently 5 feet in diameter, with 60 feet of the main body of the tree entirely destitute of branches. Its principal locality is on the mountains east of Fraser's River, in Northern California, in latitude 50° .

Although as yet very rare, and the plants in this section of the country necessarily quite small, we feel assured that in time the *A. amabilis* will be ranked as one of our most desirable trees; and certainly, if hardy, it will be greatly admired for the peculiar loveliness of its whole aspect. From all that we can learn, those who have tested it find it entirely hardy.

We must acknowledge a strong partiality in favor of these native Conifers, and as they are unexcelled, and even unequalled in the whole world, we have the greatest desire to see them acclimated with us.

The species now under notice is one of the finest of this class of trees, and for a long time was considered by botanists as a variety of *A. grandis*, which belief was strengthened by Nuttall in his *N. A. Sylva*, where he mentions it as having much larger cones and entire leaves; and the leaves of *A. grandis* being somewhat toothed or notched.

32. *A. Cilicica*, *Carriere*.—CILICIAN SILVER FIR.—Leaves, from 1 to $1\frac{3}{4}$ inch long, 1 line broad, flat, linear, straight, numerous, mostly distichous, but somewhat irregularly scattered around the young shoots, shining dark green above, and glaucous below. Cones, 7 or 8 inches long, almost 2 inches in diameter, cylindrical, obtuse, erect; with closely imbricated, coriaceous, concave, thin scales, entire on the margins; bracts, small, crenate, shorter than the scales, and terminating in a point. Seeds, slightly triangular, very resinous, with a wedge-shaped wing.

The Cilician Silver Fir is one of the newer introductions from Asia Minor, and like the *A. Apollinis* it has received a variety of synonyms and has been assigned to several positions, especially as a variety of our older well-known species. It is found extensively on the Caramanian and Taurian Mountains, where it forms immense forests, frequently in company with the Cedar of Lebanon. It generally attains the height of 50 feet, with the branches in whorls, and covered with light gray bark, becoming deeply furrowed with age.

The form is mostly very conical, with numerous, small, slender branchlets, and dark, glossy green leaves. Gordon says: "M. Kotschy discovered it in one of the valleys of the Taurus to the north-west of the great Cilician defile called *Gullah Boghos*, and on the southern slope of the great mountain chain called *Bulgardah*, in Cilicia, at an elevation of from 3,000 to 7,000 feet above the level of the sea."

On account of the strong resinous odor emitted from this

tree, the Russians have bestowed upon it the name of *Tchugatskoy*, (Strong-scented Fir,) and hence Dr. Fischer's name of *Pinus Tchugatskoi*. Young plants in this country have proven quite hardy in the open air, and although closely resembling some of our older species, especially *A. Pichta*, it may eventually prove a desirable and distinct Silver Fir.

33. *A. grandis*, Lindley.—GREAT SILVER FIR.—Syn. *Pinus grandis*, Douglas; *Picea grandis*, Loudon.—Leaves, from 1 to $1\frac{1}{2}$ inches long, linear, flat, obtuse, pectinate, emarginate, spreading, dark shining green above, and silvery glaucous below. Cones, $3\frac{1}{2}$ inches long, 2 inches broad, cylindrical, obtuse, erect, solitary, chestnut-brown color; scales, very broad, transverse, incurved on the margin, crescent-shaped, entire, deciduous; bracts, very short, ovate-acuminate, included, irregularly crenulate. Seeds, small, oblong, with a membranaceous, brittle, shining, broad, truncate wing.

A superb species in every respect, from our north-west coast. According to Douglas, it inhabits the low moist valleys of Northern California, but Nuttall "found it abundant, and constituting considerable tracts betwixt Fort Vancouver and the neighboring saw-mill, 6 or 7 miles above the fort, where many logs had been cut down and sawn into planks, which were taken for sale to Oahee, one of the Sandwich Islands. It also grew in the pine woods of Wappatoo Island, in both of which places it was frequently about 240 feet in height."

Jeffrey describes it as growing on the banks of Fraser's River, from the Falls all the way down to the ocean, but particularly on the alluvial banks of the river, near Fort Langley, growing 280 feet high, 5 feet in diameter, and 50 feet without branches; although, according to Nuttall, some trees "present a tall, naked shaft, of 100 or more feet in height, when it commences to branch with a high, spreading, pyramidal summit." This species is likewise found at South Umpqua, on the banks of Fraser's River.

At first glance, the Great Silver Fir would most likely be taken for a splendid specimen of the Common Silver Fir, but on a closer inspection its real character and beauty become apparent. The long, deep green, and shining foliage, placed regularly in two rows; the exact system of whorls of the branches; the strong, vigorous growth of the plant; together with its great hardiness and adaptability to our climate, are undoubtable proofs of its future usefulness as an ornamental tree with us.

Of all the new and rare Conifers that it has been our pleasure to test, not one exceeds this in our estimation. We have grown it in the open air for 10 years, and, entirely unprotected, it has withstood the most severe cold and intense heat, with equal and unvarying success. Our oldest specimen is the admiration of every one who has beheld it, and is a living proof of its availability to our cultivators in the Middle States. The above named plant is growing in a well drained, turfy, loose soil, but how it might be affected by a clayey or retentive subsoil, we are unable to judge. As to protection during winter, the above plant has not needed the slightest. When only six inches in height it was placed in its present position, and has been fully exposed ever since.

The wood, according to Nuttall, "was found to be soft, white, and coarse-grained, yet very well suited for flooring and other purposes, where better timber could not be had."

Var. Lowiana, Syn. *Picea Lowiana*, *Gordon*.—Low's CALIFORNIAN SILVER FIR.—Syn. *P. grandis*, *Lobb*, not *Douglas*.—Leaves, from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, quite straight, rather distant, dull glaucous green above, two faint glaucous bands below. Cones, from $3\frac{1}{2}$ to 5 inches long, and $1\frac{1}{2}$ inches broad.—(*Extracted from Gordon, in Sup. to Pinetum.*)

This new Silver Fir, according to Gordon, was first discovered and introduced into England by W. Lobb, the

collector of the Clapton Nursery. Gordon, who first described it in his supplement, and who gave it a specific name, thus alludes to its habitat, etc.: "A noble tree, frequently upwards of 250 feet in height, and 5 or 6 feet in diameter, found in British Columbia and Northern California, but always in valleys or along the alluvial banks of rivers."

There appear to be two distinct forms of *A. grandis*, perpetuated by nurserymen, known as *var. lasiocarpa*, and *var. Parsoniana*, or *Parsonii*. The first of these is described as a species in "Endlicher's Coniferarum" on the authority of Hooker, with the following distinctions: Leaves alike in color on both sides, whilst those of the species are glaucous below. Bracts broadly obovate, scarcely denticulate, mucronate. Scales, sub-rotundate and deeply pubescent.

Parson's variety has very long, incurved leaves of a peculiar glossy green color, perfectly conical in form, and, in fact, it appears to embrace every quality that can be desired in a first-class Conifer.

34. *A. Pichta*, Fischer.—SIBERIAN SILVER FIR.—Syn. *A. Sibirica*, *Ledeb.*; *Picea Pichta*, *Loudon*.—Leaves, 1 inch long, linear, flat, obtuse, incurved at the apex, mostly scattered, crowded, very dark green above, paler below. Branches, horizontal, somewhat pendulous at maturity. Cones, $3\frac{1}{4}$ inches long, cylindrical, obtuse; with obovate, rounded, entire scales; and very short, irregularly toothed bracteoles, that end in a long point. Seeds, small, with very large, membranaceous wings.

The *A. Pichta* is a rather small Asiatic species, from the mountains of Siberia and Altai, where it is found in large numbers, and forms whole forests of the richest, darkest verdure, reaching to an elevation of from 2,000 to 5,000 feet. It generally grows from 25 to 50 feet in height, and is remarkably dense and compact in growth.

The specimen standing in the arboretum of the late

John Evans, at Radnor, Delaware Co., Pa., is now about 15 feet high, and an acquaintance of several years with this plant has caused a partiality on our part for the species. It stands on a sloping bank, near a stream of water, upon whose surface the sombre hue of the Siberian Fir is reflected back in a charming manner. It is a beautiful plant in a proper position.

We have found this species exceedingly hardy in all soils and situations, even when quite young, and do not hesitate to recommend it for general cultivation as one of the best of the smaller class of Conifers.

For cemeteries, where its peculiar dark foliage would be very appropriate in connexion with other shades of verdure, we would especially advise it; and in landscape gardening, in parks and pleasure grounds, it will be found useful for creating a strong contrast. But in every case, owing to its rather small size, it should occupy a front position in a group which will be noways marred by the fine outline peculiar to this species.

The *A. Pichta* was considered by Don as but a variety of the *A. pectinata*, with the foliage of a less silvery color, more dense in habit, and of a smaller size; but subsequent investigation has proven it decidedly distinct. It much more resembles a well-formed specimen of *A. balsamea*, but with a decided superiority over that species in every respect.

Var. longifolia, Hort.—Syn. *Abies Siberica alba, Fischer*.—Is described by Gordon as a variety with longer leaves, and more silvery on the under side than the species, and is said to be found on the upper parts of the Altai Mountains.

35. A. Pindrow, Spach.—UPRIGHT INDIAN SILVER FIR. —Syn. *Picea Pindrow, Loudon*; *P. Herbertiana, Madden*; *P. Naptha, Knight*.—Leaves, from 2 to 2½ inches long, mostly distichous, occasionally scattered, flat, acute, entire,

deep-green, with a slight glaucousness on the under side. Branches, verticillate and spreading. Cones, from $4\frac{1}{2}$ to $4\frac{3}{4}$ inches long, cylindrical, smooth, dark purplish color; scales, rigid, entire, wedge-shaped; bracts, very small, rounded, emarginate. Seeds, small, angular, very resinous, shining-brown color, with large, pale brown wings.

Although a remarkably beautiful and noble tree in its native habitat, with us it is extremely precarious. According to Dr. Royle, it grows from 80 to 100 feet, with widely spreading branches, and is found at an elevation of 1,000 feet above the level of the sea. Gordon says, it is "found abundantly in Bhotan from 11,000 to 12,000 feet of elevation."

Our experience, like that of many other cultivators of this species, has been so very discouraging that we are forced to pass it by as one of those trees that are natives of a high elevation, which do not succeed in a less even, but perhaps warmer temperature. Although our plants have occasionally been defaced in severe winters, we have found our hot summer suns to be much more injurious to them than excessive cold, and even in the milder climate of England, Gordon recommends planting them when young, in a northern aspect, or screening them from the mid-day sun.

There is a close resemblance between this species and *A. Webbiana*, but Don remarks that "the former is readily distinguished from the latter by its longer and acutely bidentate leaves of nearly the same color on both surfaces, and by its shorter and thicker cones, with trapezoid-formed scales, and rounded, notched bracteoles."

36. A. Pinsapo, Boissier.—PINSAPo FIR.—Syn. *Picea Pinsapo*, Loudon.—Leaves, $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long, very stiff, sharp-pointed, crowded, scattered regularly round the shoots, deep green above, and slightly glaucous below. Branches and branchlets exceedingly numerous, the former in whorls. Cones, from 4 to 5 inches long, cylindrical or

oval, sessile; with entire, broad, rounded scales; and small bracts. Seeds, soft and angular. Cotyledons, 7.

A very striking and beautiful tree from the mountains of Spain, where it constitutes large forests, and especially in portions of the Sierra de la Nieve, at an elevation of from 4,000 to 6,000 feet, and growing from 60 to 70 feet in height.

Although we are not prepared to accord to this tree the title of "perfectly hardy," as described in Sargent's edition of Downing's Landscape Gardening, yet we can say it will succeed in many sheltered situations, if in favorable soil. We know that it has failed frequently in the neighborhood of Philadelphia and elsewhere, but we presume from the effects of a heavy soil and imperfect drainage. In our vicinity there are two or three fine plants, that, except being a little injured in a severe winter a few years since, have succeeded splendidly, and we trust that in favorable localities it may prove satisfactory. It nevertheless belongs to the class of trees that are uncertain in particular soils and situations. We are pleased to hear, however, that it proves so fine at Woodenethe, where there is a plant 10 feet high, and perfect in its proportions, showing conclusively the effect of good soil and careful cultivation.

In its native haunts, this species is frequently found near the summits of the tallest mountains, where the snow occasionally lies four or five months in the year, but when in such situations, chiefly on the northern exposures. The timber resembles that of the Common Silver Fir, and abounds in resin.

Var. variegata, Hort.—Is described by Gordon as having a portion of the leaves and smaller shoots of a pale yellow or straw color, intermixed with the ordinary ones.

37. A. Webbiana, Lindley.—WEBB'S PURPLE-CONED SILVER FIR.—Syn. *A. spectabilis, Spach*; *Picea Webbiana*,

Loudon.—Leaves, from $1\frac{1}{2}$ to 2 inches long, mostly distichous, coriaceous, linear, flat, bright glossy green above, and slightly glaucous below. Branches in whorls, spreading, horizontal, with rough scaly bark, and large, oval, resinous buds. Cones from 6 to 7 inches long, cylindrical, obtuse, very resinous, and of a bright purple color; scales, wedge-shaped, coriaceous, regularly imbricated, and quite entire; bracts, very small. Seeds, angular, with a thick, coriaceous testa, and broad, slender, membranaceous wing.

The very close resemblance between this species and *P. Pindrow* has caused much confusion among cultivators in regard to the identity of their specimens; and as both are equally susceptible of being injured by our winters, the confusion is still more increased. The *A. Webbiana* is a native of the Himalayas and the Alps of Gossainthan in Nepal, at elevations varying from 9,500 to 12,000 or 13,000 feet, where it attains to the height of 70 or 80 feet, forming a large, pyramidal-shaped tree with broad, spreading branches, and in adult specimens with a rather tabular-formed top.

Capt. H. S. Webb, who first discovered this tree, thus alludes to it: "This purple-coned pine attains a height of 80 feet or 90 feet, with a diameter of the stem near the ground of from 3 feet to 4 feet. The cone is produced on the extremity of the shoots. The leaves are about one inch long, (two inches with us), of a beautiful light green, having a white stripe in the centre. The wood even equals in the texture of its grain and in odor the Bermudas Cedar. The fruit is said to yield, at full growth, a purple pigment by expression. The silvery hue of the bark and the beautiful contrast of the leaves with the rich purple of the cone, glittering with globules of transparent resin, produce, in combination, one of the most striking objects which can well be imagined, and entitle the tree to precedence for ornamental purposes."

The remarks in regard to the hardiness of *A. Pindrow* are quite appropriate to this.

The timber of *A. Webbiana*, according to some writers, is coarse-grained, but soft and white, and abounds in a clear, light-colored resin.

NEW SPECIES OF FIRS.

38. A. Fortuni, Murray—FORTUNE'S SILVER FIR.—Syn. *A. Jezoensis*, *Lindley*, *Carriere*, *Gordon*, etc.—Leaves, from 6 to 12 lines in length, from $\frac{3}{4}$ to 1 line in diameter, not very closely appressed, distichous, solitary, sessile, terminating in a strong point, very brilliant green on both sides. Cones, from 6 to 8 inches long, rather straight, obtusely rounded at each end, short-peduncled, numerous, erect, bluish-purple when young, brown with a purplish bloom when old; scales, large, convex, pedicellate, dull, tomentose; bracts, narrow, slender, rather more than one-half the length of the scale, with a tooth at the apex, purplish-brown color. Seeds, long, narrow, angular, wedge-shaped, fawn-colored, and terminating in a narrow point, with a large wing.

This rare species, described by Gordon, and others, as the *A. Jezoensis*, is very distinct from the latter in many prominent particulars; and as the two have been confounded, Murray, in an interesting description, points out the difference, and bestows the name of *Picea Fortuni* on this, which is the *A. Jezoensis* of Lindley and later authors, but not the *A. Jezoensis* of Siebold and Zuccarini.

“It was at *Foo-chow-foo* that Mr. Fortune found it. A single tree in the grounds of a famous temple, named *Koo-shan*, there struck his attention. It was an aged Fir, stretching out its branches in a tabulated form, like a Cedar of Lebanon, and on these were growing the magnificent cones, which he figured, standing erect and thickly grouped, like rows of soldiers. It was the only tree of the kind which he saw, and from it he obtained the

seeds and specimens which he sent to Messrs. Standish and Noble."—(*Murray in "Pines and Firs of Japan."*)

In the *Revue Horticole*, M. Carriere has endeavored to show that this plant is not an *Abies* at all; but a new genus, which he has named *Keteleeria*, in honor of M. Keteleer, the eminent nurseryman of Paris. He considers that it is distinguished from *Abies* and *Picea* in having the erect cones of the latter, and the persistent scales of the former. These characters would hardly seem sufficient to found a new genus upon.

39. A. Veitchi, Lindley.—Syn. *Picea Veitchi, Lindley*.—Leaves, from 6 to 12 lines long, $\frac{3}{4}$ of a line broad, sessile, closely approximated, linear, flat, upper surface smooth and glaucous, lower surface silvery. Cones, from $2\frac{1}{4}$ to $2\frac{1}{2}$ inches long, sub-cylindrical, straight, obtuse at the apex, short-peduncled, erect near the axillæ of the branchlets, and dark brown color; scales, rounded, and disposed horizontally; bracts, same length as the scale, wedge-shaped at base, rounded truncate at apex, with a continuation of the midrib projecting in the middle. Seeds, small, angular, testaceous, crested, fawn-colored, with a short, transverse, dark-brown wing.

This handsome new species was discovered by J. G. Veitch, on Mount Fusi-Yama, at an elevation of from 6,000 to 7,000 feet, and, according to the statements of the Japanese, it is peculiar to that mountain. It forms a finely shaped tree from 120 to 140 feet in height. We make the following extracts from Murray's description of this Fir: "This is a very distinct species, having the smallest cone of any *Picea* yet known. Mr. Veitch speaks of it as intermediate between *P. nobilis* and *P. Nordmanniana*. In this he must refer to the foliage and general port of the tree, for the cones have nothing in common; the small, narrow, apparently bractless cone of *A. Veitchi* being a perfect contrast to the magnificent, large, well-bracteated cone of *P. nobilis* and *P. Nordmanniana*.

The foliage is more nearly allied to *P. Nordmanniana* than to *P. nobilis*.

This species was introduced into England in the year 1861; and we have strong hopes it may succeed with us in the Middle States, but we are not aware that it is yet in any American collection.

40. *A. concolor*.—Syn. *Picea concolor*, *Engelmann*.—This species is one of the recent discoveries in New Mexico, and is described by Engelmann as forming a tall tree on the mountains of that region, and somewhat resembling *A. grandis* in foliage. It was named *Pinus concolor* by the discoverer.

41. *A. glaucescens*, *Roezl*.—This new Fir was found by the discoverer, Roezl, on the *Monte de las Cruces*, in Mexico, and described by him as having silvery-white foliage. It is, no doubt, according to his statements, very beautiful, but we judge not at all suited to our climate.

This species has been sent to England by Roezl, under the various names of *Abies Tlapalcattuda*, *A. hirtella*, and *A. glauca*. The discoverer says of it, "The leaves are so glaucous or silvery on each side, that at a great distance one would declare the trees were covered with snow, and that they are much whiter than the *Cedrus Deodara*, on closer inspection."



3.—CEDRUS, *Link*.—CEDAR.

Leaves, rigid and persistent. Scales of the cone, closely appressed. Seeds, adhering to the base of their lacerated membranaceous wings; testa filled with balsamiferous vesicles. Carpels, separating from the axis. Male aments, from the apex of the one year old branchlets, almost biennial.

Although the older authors have classed the Cedars un-

der *Larix*, we believe that botanists of the present day are of the opinion that Link's view is correct, and that many genera are based upon much less distinctive characters than is *Cedrus*.

The different species belonging to this genus are natives of the north of Africa, India, and Mountains of Lebanon, and form beautiful, large trees. The experience of cultivators with this genus has been so adverse that it would be hazardous to call any one species entirely hardy even in the Middle States.

No genus of Conifers appears to be so whimsical in its character as this; for while we hear of plants being invariably killed in quite warm and apparently suitable localities, others again will stand well, and flourish beautifully in a higher latitude and seemingly less favorable location. Again, we occasionally find plants belonging to this genus, surviving for years in a low, wet spot of ground, and making yearly an astonishing growth that ripens regularly, and is, to all appearance, thoroughly hardy, and then suddenly die from some unknown cause.

We have other instances where trees, planted on the north side of buildings, succeed much better than anywhere else in their particular neighborhoods; whilst in another section, the finest plant we have ever seen is growing directly facing the south, and protected by the dwelling from the cold northerly winds. From our own experience we should plant the Cedars in a rather warm and protected situation, and on a light and well-drained soil; and in such the best success will usually be obtained.

The Cedars form a valuable addition to our list of ornamental Conifers, where they succeed properly. There is a pleasing gracefulness in the branches, and a beautiful tint in the foliage of the Deodar; and the noble proportions, as well as the associations connected with the history of the Cedar of Lebanon, must invariably create a partiality on the part of cultivators in its favor.

The name of this genus is supposed to be derived from the brook Cedron, in Judea, a locality where the *C. Libani* is very abundant. Loudon quotes the following derivations from other authors—*kaio*, I burn, in allusion to the use of the wood for incense. From the Arabic *kedroum* or *kedre*, power.

1. *C. Atlantica*, *Manetti*.—AFRICAN, SILVER, OR MT. ATLAS CEDAR.—Syn. *C. argentea*, *Loudon*; *C. Africana*, *Gordon*; *C. elegans*, *Knight*.—Leaves, varying from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long, mostly cylindrical, straight, rigid, mucronate, crowded, and beautiful glaucous-green color. Branches, numerous, slender, and mostly horizontal. Cones, from $2\frac{1}{2}$ to 3 inches long, ovate, resiniferous, and glossy; scales, closely appressed, flat, smooth, coriaceous. Seeds, small, soft, angular, with long, transparent wings.

A beautiful species of large size, from the Atlas range of mountains, in the northern portion of Africa, at elevations varying from 7,000 to 9,000 feet, where it forms a tree from 80 to 100 feet high.

The African Cedar is specifically distinct from the Cedar of Lebanon, and although resembling the latter in general appearance, it must not be considered as a mere variety, because it is so nearly allied. The acute M. Decaisne has declared emphatically that this plant is a true species, and distinct from *C. Libani*. The same botanist records the following interesting notes, taken by M. P. Jamin, director of the nursery at Biskara. "Cedars begin to appear at three-fourths up the slope of Fougour, where they produce a magnificent effect, and form a thick forest up to the very summit of the peak. It is not uncommon to find specimens 40 yards high, and $1\frac{1}{2}$ yards in diameter at the but. The two species live together, but they are distinguished at first sight. The Silver Cedar was covered with ripe cones; on that of Lebanon they were more behind, and flowers were still visible on some of the branches. The habit of the Silver Cedar is that of the Silver Fir—it is

pyramidal, and its foliage is silvery; while that of the Cedar of Lebanon is dark green, and its branches horizontal, as we all know. The number of trees is estimated at 20,000; the finest are on the northern face of the peak." M. Jamin saw many dead of old age, or struck by lightning.

The young plants of the African Cedar, although exceedingly like the Cedar of Lebanon, are distinguished by their more slender branches, and more silvery, dense, and stronger foliage. In this country, young plants are more hardy and rapid in growth than the Cedar of Lebanon.

The two species require the same conditions, and an appropriate situation for the *C. Libani* will be equally fitting for the *C. Atlantica*. As far as their respective hardiness is concerned, we can detect but little difference. It is, however, a wise precaution to give the young seedlings a slight protection of evergreen boughs during the winter months.

In protecting a plant, the matter should not be overdone, as we have suffered dearly in this respect. Wishing to preserve a fine bed of the African Cedar during its first winter in the open ground, we gave it a heavy covering of branches, and the consequence was that every vestige of bark was eaten off by the field-mice; and yet others near by, without any protection, and some with a very slight shelter, escaped uninjured. In a neighboring bed were a few very rare Firs, covered with corn fodder, and they were eaten up entirely, not even the wood remaining to mark the spot.

Since that time we have been very careful to afford only a moderate protection. A few evergreen branches are far preferable to a heavy mass of covering of any description.

2. *C. Deodara*, Loudon.—DEODAR CEDAR.—Leaves, from 1 to 2 inches in length, 4-sided, or occasionally 3-sided, rigid, acute, very numerous, bright green, covered with a

glaucous bloom. Branches, spreading and drooping. Cones, from 4 to 5 inches long, ovate, obtuse, very resinous, rich-purple when young, dark-brown at maturity; scales, closely appressed, smooth, thin, entire, broad, and separating from the axis at maturity. Seeds, regularly wedge-shaped, soft, with a large, bright brown wing.

Gordon, in the supplement to his *Pinetum*, says: "It has not yet been found in a natural state either in Eastern Nepal or Sikkam, although these gigantic sons of snow fringe the bare rocks, and fix their roots where there appears to be very little soil, on the lofty passes from Nepal to Cashmere; and, according to Capt. Pemberton, (in his Report on the Eastern Frontier,) the most southern point to which the Deodar has yet been traced is the summit of the lofty ranges immediately west of Munepoor, an interesting region, which, with the Singfo Mountains, south-east of Assam, carry the zone of perpetual snow farthest south in India. The Deodar also grows to extraordinary dimensions on all the higher mountains throughout the western Himalayas, and occurs in vast forests in Kunawur, Kumaon, Kooloo, Mussoorie, and on the Chumbra range in Kangara, at elevations varying from 6,000 to 12,000 feet. At Rashulah, in Kooloo, a forest exists with trees from 18 to 24 feet in girth, at 4 feet from the ground; and, according to Dr. Jameson, of two trees, measured by him, near Mulare, in Gurhwal, at an elevation of 11,000 feet, one girthed 26 feet, at three feet from the ground, and the other 27 feet; but, as a general rule, the finest trees are always found growing on the north side of barren mountains, on thin, poor soil, formed from the decomposition of granite, gneiss, mica, or clay-slate."

Capt. Johnson, in his *Excursion to the Sources of the Jumna*, states that the peaks on the northern side of the Boorung Pass were completely hidden by forests of gigantic Deodars, some of which measured 33 feet in circumference, and were from 60 to 70 feet without a branch.

Dr. Griffith writes: "But to see the Deodar in its greatest perfection, one must visit the snowy ranges and lofty mountains of the interior, far from the influence of the plains, and where for nearly half the year it is enveloped in snow; there its dimensions become gigantic." It is certainly to be lamented that so beautiful a tree as the Deodar should not be entirely hardy with us. It possesses all the qualities of that class of trees denominated "Weepers," and in its whole structure it appears as if Nature had endeavored to concentrate all the desired qualities of the Conifers into one.

In the Deodar Cedar the feathery gracefulness of the Hemlock is combined with the durability of the Larch, and the form of the Spruce united with the hue of the Mexican Pines.

Loudon remarks: "The feathery lightness of its spreading branches and the beautiful glaucous hue of its leaves render it, even when young, one of the most ornamental of coniferous trees; and all the travellers who have seen it full grown, agree that it unites an extraordinary degree of majesty and grandeur with its beauty."

The Deodar Cedar has now been in cultivation in many sections of our country for several years, and we judge sufficiently tested in all soils and situations, to enable us to arrive at a proper estimate of its worth as an ornamental tree. But it is so variable in different soils that but few persons in the Middle States are willing to pronounce it hardy; and yet, in particular localities, we have noticed fine large specimens that were apparently thriving as vigorously as could be desired, even after having passed through two exceedingly severe winters. In all parts of England and Scotland it grows very luxuriantly, and appears perfectly adapted to the climate; some writers asserting that it is even superior in hardiness there to the Cedar of Lebanon.

As some botanists have considered the Deodar but a

variety of the *C. Libani*, we make the following extracts from the Gardener's Chronicle in reference to the two: "In the first place, it is to be observed that if the Cedar of Lebanon and Deodar are sown in mixture, the seedlings are unmistakably different. One is green, stiff, and erect; the other is glaucous and drooping. No one, we believe, ever saw a Cedar of Lebanon with its seedling stem turned downwards; no one, a Deodar in any other state.

"In advanced age, the difference is preserved; the Cedar of Lebanon may become glaucous, but it does not droop; the Deodar may become green, but it will not straighten its leader; the one is always stiff and massive, the other light and graceful." The writer then points out the differences in the wood of each, referring to the admirable durability of the Deodar's timber, and the proneness of that of the Cedar of Lebanon to decay. He also mentions the difference in the cones; the scales of those produced by the Cedar of Lebanon are exceedingly persistent, whilst those of the Deodar drop at maturity.

The timber of the Deodar is exceedingly valuable and lasting, equalling in this respect that of the Larch. Loudon says it possesses "all the qualities attributed by the ancients to that of *C. Libani*. It is very compact and resinous, and has a fine, fragrant, refreshing smell, like that observed when walking in pine groves towards evening, or in moist weather, and very different from that of the Cedar of Lebanon. Its wood has a remarkably fine, close grain, capable of receiving a very high polish; so much so, indeed, that a table formed of a section of a trunk nearly 4 feet in diameter, sent by Dr. Wallich to Mr. Lambert, has been compared to a slab of brown agate."

Loudon also quotes from the writings of others in regard to its durability, and extracts a description from Lambert's *Pinus*, where a building was torn down that was estimated to have stood for 225 years, and notwithstanding the great length of time, the timber, which was of the Deodar, was

found sufficiently sound to use in erecting a new house. Loudon also says: "It is regarded by the Hindoos as a sacred tree, and is called by them *Devadera*, or the 'Tree of God.' In some places it is highly venerated, and never used but to burn as incense on occasions of great ceremony."

The following varieties are mentioned by Gordon:

Var. viridis, Hort.—Syn. *C. D. tenuifolia, Knight.*—Is like the species in every particular, except that the foliage is of a light green tint, without any glaucousness, and the habit rather more slender.

Var. robusta, Hort.—Syn. *C. D. gigantea, Knight.*—The only difference between this and the species is in its larger and coarser leaves and branches. In our own collection, a specimen planted several years ago is not very flourishing.

Var. crassifolia, Hort.—The leaves in this are thicker and shorter, with more stiff, compact branches than those of *C. Deodara*; in other respects they are alike.

3. C. Libani, Barrelier.—CEDAR OF LEBANON.—Syn. *Pinus Cedrus, Linnæus*; *Larix Cedrus, Miller*; *Abies Cedrus, Poiret.*—Leaves, from $\frac{3}{4}$ to 1 inch in length, acuminate, acute, needle-form, rigid, few in the fascicles, and deep-green color. Branches, horizontal, spreading, verticillate, and covered with rough bark. Cones, from 3 to 5 inches long, oval, obtuse, very persistent, grayish-brown color; scales, broad, closely appressed, coriaceous, thin, truncate, and slightly denticulate on the margin. Seeds, quite large, irregular in form, light-brown color; with broad, thin, membranaceous wings. Cotyledons, 6.

This magnificent Conifer is interesting from the frequency with which it is mentioned in the sacred writings.

This species, says Michaux, was believed to be peculiar to the Mountains of Lebanon, in Asia Minor, until Pallas discovered it in the north of Russia, in the year 1770, but Loudon speaks of it as inhabiting the coldest parts of the mountains of Libanus, Amanus, and Taurus, where it may



Fig. 25.—CEDRUS LIBANI, REDUCED ONE-QUARTER.

now be found in great numbers. Michaux says: "Modern travellers, and among others Mr. Labillardiere, who visited that part of the East in 1788, inform us that the large forests seen by Belon, in 1550, upon Mount Aman, have disappeared, and that a few of these trees only are found upon the highest, where they grow immediately below the snow which caps the summit during a great part of the year. He computes their number at about 100, of which he observed seven of extraordinary size, and measured one that was 30 feet in circumference, with the primary limbs 9 or 10 inches in diameter. Standing alone, and enjoying the free access of the light and air, they were less remarkable for stature than for expansion. In massive forests they probably obtain a height proportioned to their diameter; but this tree has always been remarked for the length of its limbs, as is shown by the allusion of the Hebrew poet: 'They shall spread out their branches like the Cedar.'"



Fig. 26.—CONE OF CEDRUS
LIBANI, ONE-HALF SIZE.

J. J. Smith, Esq., in a note to the above remarks, says: "M. Laure, an officer of the French marine, who, with the Prince de Joinville, visited Mount Lebanon in 1836, says that all but one of the sixteen old Cedars mentioned by Belon in 1550, and by Maundrell in 1696, were still alive, although in a decaying state, and that one of the healthiest, but perhaps the smallest trunks, measured 36 English feet in circumference."

According to Michaux, "The few remaining stocks on Mount Lebanon are preserved with religious veneration by the Christians of that country. According to the missionaries in the East, the Patriarch of the Maronite Christians,

inhabiting Mount Lebanon, attended by a number of bishops, priests, and monks, and followed by 5,000 or 6,000 devotees, annually celebrate in their shade the festival of the Transfiguration, which is called the 'Feast of Cedars,' and ecclesiastical censures are denounced against those who shall injure these consecrated trees."

In this country, the Cedar of Lebanon is found to be pretty generally hardy, excepting in a few instances where the trees have been in exposed and unfavorable situations. With us it has succeeded to our entire satisfaction, and we can therefore recommend it without reserve, if proper cultivation and a moderate amount of care be given to it. We have every reason to believe that the Cedar of Lebanon, in light, well-drained soil, will ultimately be successful, if the growth is slow, and, in consequence, well ripened.

In England, ever since the year 1680, when it was first introduced, it has given universal satisfaction, and the splendid specimens enumerated by Loudon, and mentioned by Downing, are of large size. One specimen in particular, at Sion House, is 72 feet high and 24 feet in circumference; and as a proof of its great rapidity of growth, three specimens are mentioned which made an increase in the circumference of their trunks of respectively 5 feet 1 inch, 3 feet 9 inches, and 3 feet 8 inches, in 32 years. These trees were growing at Hopetoun House, Scotland, and were planted in the year 1748; and Michaux mentions that 100 years after this species was introduced into England, two of these original specimens, growing in the medical gardens at Chelsea, near London, were upwards of 12½ feet in circumference at 2 feet from the ground, and extended their limbs more than 20 feet in every direction. The fine stock of trees now becoming so plentiful in that country were grown from seed furnished by these old plants.

The ornamental character of this tree is of the highest order, but it should invariably be grown singly, and never

in groups on a highly cultivated lawn. The form of the tree, when young, is regularly conical, with widely spreading, verticillate branches, and foliage of a rich deep-green. As the tree increases with age, it loses the conical form and gradually assumes the tabular, with a somewhat rounded, open head; and this change causes a different effect to be produced—a change from the beautiful to the picturesque.

A writer in the London Horticultural Magazine, in an article entitled “Sacred and Classical Planting,” thus speaks of this tree for that purpose: “Gazing upon this object, the reflections which it excites are numerous. It was seen from Jerusalem, casting a *weight of glory* over the lofty mountains which environed that city like a magnificent rampart. It grew on that site whence the eye commanded a spectacle more glorious, perhaps, than was ever enjoyed from any other spot on the globe, embracing a view almost without interruption from the waters of the Mediterranean to the confines of the Persian Gulf.

“In its living state, the Cedar, no doubt, conferred a very peculiar and striking character to the scenery of the East; its depth of green and the disposition of its branches rendering it for glory and beauty, unequalled amongst all the objects of the vegetable kingdom.”

The timber of the *C. Libani* was considered by the sacred historians more durable and lasting than any other, but if the opinion entertained by Prof. Martyn and others should be correct, the ancients confounded several species, and described other trees belonging to distinct genera under the one name of Cedar. The Cedar of Lebanon, as known at the present day, is inodorous, soft, and very perishable.

Var. nana, Loudon.—We have had this pretty dwarf variety in cultivation, but from some unknown cause we could not induce it to thrive. It has quite diminutive

leaves, and short, stubby branchlets. Its height is about 3 or 4 feet.

Var. argenteis, Loudon.—This author says the leaves of this variety are of a silvery hue on both sides, and Gordon says, contrast well in old trees with the more common form with green foliage.

Var. pendula, Knight.—Gordon says, "This variety has slenderer and more pendulous branches than the common Cedar of Lebanon."



4.—CUNNINGHAMIA, R. Brown.

Flowers, monœcious, on different branches; male aments, terminal, in dense clusters, and numerous, with the stamens closely imbricated at first, but finally more separated, and the anthers with a slender, filiform footstalk, expanded at the apex into a pointed, yellowish, semi-orbicular scale or appendix; female aments, solitary, or clustered, terminal, sessile, pale yellow. Cones, smallish, globose, or ovate, and persistent. Scales, small, (scarcely perceptible); with large, coriaceous, serrulated bracts. Seeds, three, attached to the base of a scale, ovate elliptical, with a membranaceous wing.

This genus contains but one species, which closely resembles the *Araucaria* in general appearance, but is very distinct botanically. According to Loudon, it was "named by Mr. Brown in honor of *Mr. James Cunningham*, an excellent observer in his time, by whom this plant was discovered; and in honor of *Mr. Allan Cunningham*, the very deserving botanist who accompanied Mr. Oxley in his first expedition into the interior of New South Wales, and Captain King in all his voyages of survey of the coast of New Holland."

A curious feature in the morphology of the cones of

this genus is the large bract, or quasi-scale, which has until recently been mistaken for the true scale, the latter being of very small size, in fact a mere transverse ridge inside the bract, near the base of the latter, and observable just above the seeds, adherent to, but overgrown by the bract.

This interesting and curious formation was perhaps first detected by Richard, in his "*Mémoires sur les Conifères*," who decided that what at first appeared to be the scale, was in reality the bract. Siebold differed from him, but has never satisfactorily proven his theory to be incorrect. Murray follows Richard, and states additional facts to prove his view correct.

C. Sinensis, R. Brown.—Syn. *Abies major Sinensis, Plukenet*; *Pinus Abies, Loureiro*; *Abies lanceolata, Persoon, Desfontaines, and Willdenow*; *Belis jaculifera, Salisbury*; *Belis lanceolata, Sweet*; *Pinus lanceolata, Lambert*; *Cunninghamia lanceolata, Van Houtte*.—Leaves, from $1\frac{1}{2}$ to 2 inches long, lanceolate, sessile, acuminate, alternate, flat, deflexed, rigid, coriaceous, somewhat serrulate, very numerous, bright-green above, slightly glaucous below. Cones, from 1 to $1\frac{1}{2}$ inches long, ovate-globose, erect, very persistent, mostly clustered, sessile; scale, very small and obscure, a mere transverse ridge adherent to the bract; bracts, large, prominent, serrulated, in form like that of a dilated leaf, triangularly hastate, concave and unguiculate at the apex. Seeds, ovate-elliptical, compressed, and surrounded by a membranaceous wing. Cotyledons, 2, oblong-obtuse.

This handsome tree is a native of the warmer portions of China, rarely exceeding 30 or 40 feet in height, although specimens have been met with that measured 50 feet. In England, it is considered entirely hardy, and with us it usually flourishes very freely, but changes to a dingy hue during the winter months, which the mild days of spring quickly restore to its original bright, glossy-green color. We find it succeeding indifferently in many places, although we can point to specimens around Philadelphia of fine size.



Fig. 27.—*CUNNINGHAMIA SINENSIS*.—BRANCH ONE-HALF SIZE, THE SINGLE LEAF AND CONE OF NATURAL SIZE.

An excellent specimen in the Evans arboretum, at Radnor, is now 10 or 12 feet in height, and perfectly satisfactory. It stands, however, in a very favorable situation, being on the southern declivity of a thickly wooded hill, and therefore protected from the cold, high winds. The best specimen we have ever seen was growing in our own collection, but very mysteriously died on the approach of warm weather two or three years since. This fine plant was about 8 feet high, and had been exposed in the open ground for several years, with a slight covering during the winter. The situation was exceedingly bleak and unsuitable, but younger plants in other portions of our ground remained uninjured.

The great drawback to the culture of this tree is in its luxuriant growth, which, in rich soils, is liable to be of a succulent nature, and therefore unable to survive the winter. We must, however, give it the credit of being quite as reliable as the majority of the so-called uncertain Conifers.

The *Cunninghamia*, when planted singly on a lawn, presents one of the most agreeable objects imaginable, the main body of the tree being as straight as an arrow, with the branches diverging horizontally in regular whorls or verticils, and the branchlets produced in two rows, which droop very gracefully. The foliage is of a peculiar bright glossy green, that is quite unusual and particularly pleasing. Its near resemblance to the *Araucarias*, a genus which we are debarred from enjoying fully, is also an additional incentive for endeavoring to cultivate this splendid tree.

In Fortune's description of the trees of China, he mentions the *Cunninghamia* as follows: "The sides of the mountains here were clothed with dense woods of the Lance-leaved Pine, (*Cunninghamia lanceolata*.) This was the first time I had seen this Fir tree of sufficient size to render it of value for timber. Many of the specimens

were at least 80 feet in height, and perfectly straight. There was a richness, too, in the appearance of its foliage, which I had never seen before; sometimes it was of a deep green color, while at others it was of a bluish tint. There are doubtless many varieties of this tree among these hills."

Var. glauca, Hort.—Gordon says: "This variety differs from the species in having its leaves on the branchlets of a glaucous color."

5.—**SCIADOPITYS**, *Siebold & Zuccarini*.

Flowers, monœcious; male aments, sessile, terminal, ovato-globose, and surrounded with scales at the base, with numerous, closely imbricated, alternate stamens, having smooth, short filaments; female aments, when young, sessile, but at maturity, with a short peduncle and numerous persistent, coriaceous, glabrous, entire, semi-orbicular scales, and from 7 to 9 ovules. Cones, elliptic or cylindrical, large, obtuse; with coriaceous, persistent, wedge-shaped scales, and short, broad bracts, adhering thereunto. Seeds, from 7 to 9 under each scale, imbricated, elliptical, compressed into a membranaceous wing.

This new and rare genus has lately been discovered in the mountains of Japan, and is very distinct in appearance from all others of the Coniferæ. But one species is as yet known to botanists, and that forms a tall tree with very curious, whorled branches, and verticilled leaves.

As the few plants in this country are as yet comparatively untested in the open air, we cannot determine its powers of endurance, but we confidently believe that it will grow here with at least tolerable success.

The name is derived from two Greek words, signifying *umbel* and *pine-tree*.

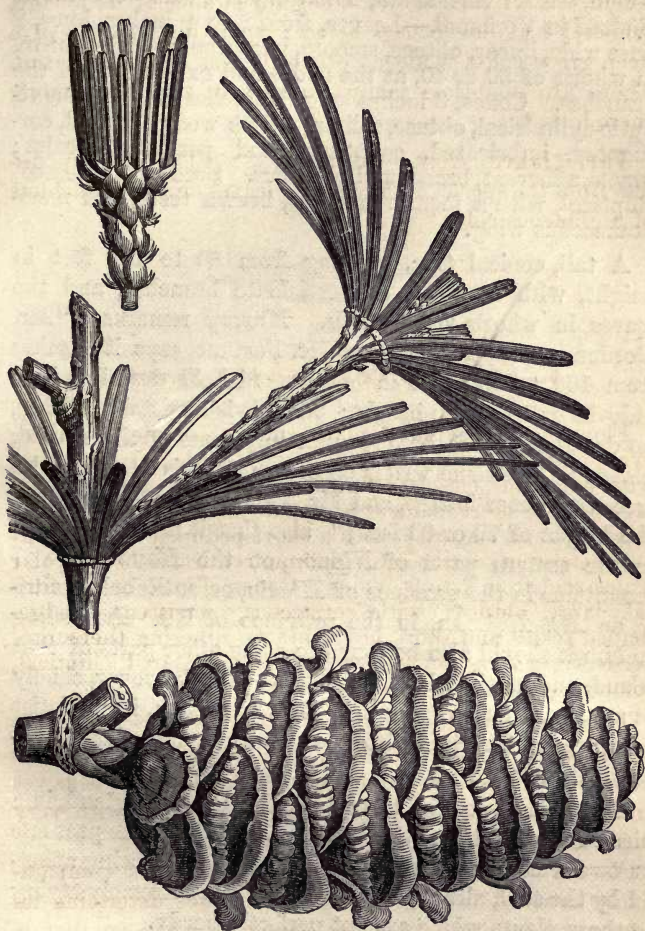


Fig. 28.—*SCIADOPITYS VERTICILLATA*.—LEAVES AND BUD ONE-HALF SIZE; CONE OF NATURAL SIZE.

S. verticillata, Siebold & Zuccarini.—UMBRELLA PINE.—Syn. *Taxus verticillata, Thunberg*; *Pinus verticillata, Siebold* in Verhandl.—Leaves, from 2 to 4 inches long, 2 lines wide, linear, obtuse, smooth, persistent, sessile, entire, in whorls of 30 or 40, at the nodes and extremities of the branches. Cones, 3 inches long, $1\frac{1}{2}$ inches in diameter, elliptic-cylindrical, obtuse, solitary; with wedge-shaped, corrugated, imbricated, coriaceous and persistent scales; bracts, adherent, broad, and glabrous. Seeds, compressed, elliptical, with a membranaceous, brown testa, and membranaceous wing.

A tall, conical tree, varying from 80 to 140 feet in height, with alternate or verticillate branches, and the leaves in whorls or verticils. Murray remarks: "Mr. Gordon, on the authority of Mr. Fortune, says it reaches from 100 to 150 feet in height. Siebold describes it as only 12 or 15 feet in height; but this is a mistake, arising, no doubt, from his having seen only some of the smaller plants." The same writer observes: "It is a pyramidal tree with dense foliage, and Mr. Veitch informs us reaches the height of 70 or 80 feet;" also that it is "found wild in the eastern parts of *Nippon*, on the *Koya* ridge of mountains in the province of *Kiusiu*, or, as Siebold writes it, on *Mt. Kojasan*, in the province of *Kii*. According to him it should also be found in some other parts of that island, and of the island of *Sikok*. It is, however, chiefly in a state of cultivation that it is met with, its varieties being great favorites with the Japanese, and planted extensively in their gardens and about their temples."

The *Sciadopitys* in the Bagshot nursery, England, in a bleak and unsheltered situation, has withstood the past one or two winters without the slightest sign of being affected by the cold, although the weather was extremely trying to those plants which are not perfectly hardy.

Some of the English growers who have had an opportunity of judging of its merits, consider it "one of the finest Conifers of Japan, or, after the *Deodar*, of all Asia."

We noticed young plants of this new candidate for popular favor in the extensive collection at Wodenethe, on the Hudson, a year or two since, and our American cultivators will no doubt soon be informed of its success. Many writers on Japanese plants are quite sanguine in regard to the hardiness of this plant in our country.



6.—SEQUOIA, *Endlicher.*

Flowers, monœcious, terminal, solitary. Sterile aments globular, on short, slender peduncles. Cones, oval or globular, with wedge-shaped, persistent scales. Seeds winged, and from 3 to 5 under each carpellary scale.

This magnificent genus comprises two very distinct species, both of which are natives of California, one of them being occasionally found more to the northward. Since the discovery of the species known as the "Great Tree of California," it has been attempted to give the genus other and inappropriate names; the name of Sequoia had been previously established by Endlicher. Only a few, in the face of all botanical rules, still persist in their absurd nomenclature.

The derivation of the name Sequoia is uncertain, but a recent writer in the "Gardener's Monthly" argues very forcibly that its origin might have been from the celebrated Cherokee Chief "*See-quah-yah*," whose life has been spent in endeavoring to enlighten his race by inventing an original alphabet, and by the introduction of mechanical contrivances and useful implements for their benefit.

1. *S. gigantea*, *Torrey*. — GREAT TREE OF CALIFORNIA.—Syn. *Wellingtonia gigantea*, *Lindley*, *Gordon*, etc.; *Washingtonia gigantea*, *Kellogg*.—Leaves on the young shoots, spreading, needle-shaped, sharp-pointed,



Fig. 29.—SEQUOIA GIGANTEA.—NATURAL SIZE.

scattered spirally around the branchlets; finally scale-shaped, imbricated, mostly appressed, with generally an acute apex; numerous, and persistent, light green color. Branches, horizontal, and spreading. Cones 2 inches long, ovate, terminal, solitary; with numerous, prickled, stipitate, scales. Cotyledons, from 3 or 4 to 6.

This species is a native of the Sierra Nevada range of mountains in California. As its discovery has been conceded to several persons, we are unable to say with any certainty to whom belongs the honor. The English naturalist Lobb is supposed by many to have first met with it near the source of the river Stanislaus, and other writers attribute its discovery to Douglas, in the year 1831; but perhaps the most probable statement is the one generally believed throughout the section of country of which these trees are natives, and is, that a company of miners on a prospecting tour came accidentally upon the Calaveras group, and the trees became thenceforth the wonder of the botanical world. One of the best descriptions of this species is given by Bayard Taylor, in his interesting work entitled "Home and Abroad."

After a graphic account of the immense size of these vegetable giants, he describes the felling of one of the largest specimens, which was a mass of solid wood ninety feet in circumference, and was performed by two sets of hands with the aid of long pump-augers. We give the description in the author's own words. "After a steady labor of six weeks the thing was done, but the tree stood unmoved; so straight and symmetrical was its growth, so immense its weight, and so broad its base, that it seemed unconscious of its own annihilation, tossing its outer branches derisively against the mountain winds that strove to overthrow it. A neighboring pine of giant size was then selected, and felled in such a way as to fall with full force against it. The top shook a little, but the shaft stood as before; finally the spoilers succeeded in driving

their wedges into the cut. Gradually and with great labor one side of the tree was lifted; the line of equilibrium was driven nearer and nearer to the edge of the base; the mighty mass poised for a moment, and then, with a great rushing sigh in all its boughs, thundered down. The forest was ground to dust beneath it, and for a mile around the earth shook with the concussion."

According to the annual rings, the age of this tree was 3,100 years, and it contained 250,000 feet of timber. The stump is now used for a ball-room, and the trunk for a bowling alley. Dr. Bigelow says of this specimen: "It required 31 of my paces of 3 feet each to measure thus rudely its circumference at the stump; and the mere felling of it cost, at California prices for wages, the sum of \$550."

When we consider the sublime proportions of these wonderful creations of nature, all other large trees must sink into perfect insignificance in the comparison. Just imagine a man on horseback riding a distance of 75 feet in the hollow of a tree, and emerging from a knot-hole in the side. In fact no description can possibly convey an adequate idea of the majesty of these vegetable wonders. "Indeed," says Dr. Bigelow, "these giants of the forest are so marked in their rusty habits from their present associates, that we can hardly view them in their present relations, except as links connecting us with ages so long past that they seem but reminiscences of an eternal by-gone. They seem to require but the process of petrification to establish a complete paleontological era."

Professor Brewer, in a communication to Sir William Hooker, thus speaks of the Great Tree of California: "An interesting discovery this year has been of the existence of the big trees in great abundance on the western flanks of the Sierra Nevada, in about lat. 36° or 37° . They are very abundant along a belt at 5,000 to 7,000 feet altitude, for a distance of more than 25 miles, sometimes in groves,

at others scattered through forests in great numbers. You can have no idea of the grandeur they impart to the scenery, where at times a hundred trees are in sight at once, over 15 feet in diameter, their rich foliage contrasting so finely with their bright cinnamon-colored bark. I found trees larger than they occur further north, (in the Calaveras and Maipula groves.) The largest tree I saw was 106 feet in circumference, at 4 feet from the ground. It had lost some buttresses by fire; it must have been at least 115 or 120 feet when entire; it is 276 feet high. The Indians tell of a much higher tree, which I did not see.

"There seems no danger of the speedy extinction of the species, as it is now known in quite a number of localities, and, contrary to the popular notion, there are immense numbers of younger trees of all sizes, from the seedling up to the largest. There has been much nonsense and error published regarding them. I have no doubt of the true generic relations. I think that no one who is familiar with both species *in situ* would separate them generically from the *Sequoia sempervirens*, also in abundance in this State, and fully as restricted in its distribution; nor do I think the names of *Wellingtonia* and *Washingtonia* can be duly respected."

We were greatly in hopes of being able to entirely acclimate this beautiful species, but although it generally manages to live, most specimens that have come under our notice are not healthy in appearance. The luxuriant growth late in the season, so common in trees from the Pacific coast, is the great drawback to its successful cultivation with us. A slight covering with evergreen boughs during the winter months is absolutely necessary to insure the vitality of the leading shoot. Perhaps the finest specimens to be found in the Northern States are growing in the extensive collection of Ellwanger & Barry, at Rochester, N. Y.

This species is exceedingly difficult to transplant, more

so, in fact, than any Conifer we have tested. In many instances where the plant has not been immediately killed by the removal, the lower branches have been disfigured and the outline entirely destroyed. Great care should consequently be taken in the operation, and the roots always preserved from undue exposure to the air. The names that have been applied to this tree are remarkable illustrations of departure from the accepted rules of botanical nomenclature. Lindley, against both rule and taste, called it *Wellingtonia gigantea*. Kellogg, of California, not willing that a California tree should bear the name of a British soldier, with equal impropriety called it *Washingtonia gigantea*; *Americanus gigantea* has also been proposed. Doct. Torrey plainly showed that it belonged to the old genus *Sequoia*, and most English botanists now admit that it is properly placed here; but instead of accepting Torrey's specific name, *gigantea*, they now call the tree *Sequoia Wellingtonia*, which is quite at variance with accepted rules.

✓ 2. *S. sempervirens*, *Endlicher*. — RED-WOOD. — Syn. *Taxodium sempervirens*, *Lambert*. — Leaves, from $\frac{1}{2}$ to an inch long, linear, smooth, distichous, flat, acute, coriaceous, dark shining green, glaucous beneath. Branches, numerous, horizontal, and spreading. Cones, 1 inch long, roundish, solitary, and terminal, with numerous, thick, rough, trapezoidal scales, furnished with a strong, obtuse point, and terminating below in a stout, angular pedicel. Seeds, from 3 to 5 under each scale.

This species is also a magnificent tree, and is much more plentiful than the preceding, and also occupies a more extended range of country. It was first discovered by Menzies on our north-west coast in the year 1796, and subsequently by Dr. Coulter in 1836, and by Hartweg at a more recent date. The latter explorer mentions finding specimens of this tree 270 feet in height, with a clean trunk 60 or 70 feet high, growing on the mountains of

Santa Cruz above Monterey. Douglas says he repeatedly measured specimens 270 feet long and 32 feet in circumference, at 3 feet from the ground, and others that even exceeded 300 feet in height.

He thus alludes to the immense size of these trees: "But the great beauty of the Californian vegetation is a species of *Taxodium* which gives the mountains a most peculiar, I was almost going to say awful, appearance; something which plainly tells we are not in Europe." A horizontal slab sawn from this species was received from Dr. Fischer, which he mentions as containing 1,008 annual rings and measuring 15 feet in diameter. A specimen has been found that was 55 feet in circumference, 6 feet from the ground; its enormous magnitude having given rise to the name of "*The Giant of the Forest*."

We only introduce this species in this place for the purpose of noticing one of our finest native trees; for unfortunately it will not thrive in the Middle States. Our mildest winters in this latitude almost invariably kill it down to the snow-line, and not unfrequently the whole plant perishes. At Washington and Baltimore it succeeds very indifferently, as it requires a still more genial temperature than these localities afford.

Where it flourishes, the Californian Red-wood forms a magnificent tree, making annually the most astonishingly vigorous growths, and is clothed with a peculiar deep green foliage that is unusually handsome. The timber is of a handsome red color, fine and close-grained, but light and brittle, and never attacked by insects.

to be
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7.—**LARIX**, *Tournefort*.—**LAROH**.

"Catkins, lateral and scattered, bud-like, sterile flowers nearly as in *Pinus*, but the pollen of simple spherical grains. Cones, ovoid, erect; the bracts and scales, persistent;

otherwise as in *Abies*. Leaves deciduous, soft, all foliaceous; the primary ones scattered; the secondary very many in a fascicle developed in early spring from lateral, scaly, and globular buds. Fertile catkins crimson or red in flower.”—(*Gray*.)

The Larch is one of the few genera belonging to the Conifers that have deciduous leaves; but it is nevertheless capable of producing the same effects in planting, and is subject to the same rules in regard to removal, soil, etc., as govern those with evergreen or persistent leaves. The genus comprises but few species, which are natives of the colder regions of Europe, Asia, and America.

As ornamental trees, the Larches have long been favorites with our planters on account of their regular conical form, slender, delicate branches, soft, light-green leaves, and their perfect hardiness; but we too frequently notice the entire absence of taste displayed in the indiscriminate use of them. There is no tree that requires more judgment in selecting its proper locality for planting than the Larch.

The trees are picturesque, and especially adapted to those bold, wild landscapes, which we occasionally find in large plantations; but to use them indiscriminately on a small, highly cultivated lawn, is the opposite of good taste. Downing says:

“For picturesque beauty, the Larch is almost unrivalled. Unlike most other trees, which must grow old, uncouth, and misshapen, before they can attain that expression, this is singularly so, as soon almost as it begins to assume the stature of a tree. It can never be called a beautiful tree, so far as beauty consists in smooth outlines, a finely rounded head, or gracefully drooping branches. But it has what is perhaps more valuable, as being more rare—the expression of boldness and picturesqueness peculiar to itself, and which it seems to have caught from the wild and rugged chasms, rocks, and precipices of its native moun-

tains. Then its irregular and spiry top and branches harmonize admirably with the abrupt variation of the surrounding hills, and suit well with the gloomy grandeur of those frowning heights."

Being a rapid-growing, hardy tree, the Larch is invaluable for newly planted places; but its greatest fault, and perhaps its only one, is the difficulty experienced in removing it. True, many persons are entirely satisfied if their trees show any signs of vitality after undergoing a rough, careless removal; but the real lover of trees prefers having them retain all their lower branches, and preserve that luxuriance of vegetation, so peculiar to the genus. This is only obtained by removal when small, at a proper season, and in the most careful manner. Unlike the trees of the other genera of the family, the Larch must be transplanted very early, on account of the propensity of the buds to start into action after a few mild days in the spring. If delayed for some time after this takes place, the destruction of the tree is almost certain.

The timber of the Larch is very valuable, on account of its durability, exceeding in this respect almost any other kind. The "Venice turpentine" is extracted from a Larch, as is a substance known as the "Manna of Briancon."

1. L. Americana, Michaux.—AMERICAN, OR BLACK LARCH.—Syn. *Pinus pendula*, Aiton; *Pinus microcarpa*, Lambert.—Leaves from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long, thread-like, linear; slender, light bluish-green color. Branches, less numerous than in the European species, spreading, drooping, and in whorls. Cones, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in length, ovoid, and of a reddish color; scales, few, slightly reflexed, and rounded. Seeds, very minute, with short wings.

Although not equalling in beauty the European Larch, according to our ideas of form, we must nevertheless recommend our native species for hardiness, rapid growth, picturesque habit, and other good qualities.

It is emphatically a northern tree, being never found

south of the upper portion of Virginia, and even in those localities only in exposed mountainous districts, in moist, swampy soil. In the northern portion of its district, in Canada, etc., it is known as the *Hackmatack*; in the southern portion, in New Jersey, etc., as the *Tamarack*; but the most desirable and appropriate name is *American Larch*, which, with the *Black Larch*, is universally understood. It is the *Epinette rouge* of the French Canadians, thus perhaps giving rise to the name of *Red Larch*, which was described by Loudon as a variety, *L. Americana rubra*, and adopted by Lambert as a species, *L. microcarpa*. According to Gray, it is probably only a variety, which change of climate may diversify into other forms.

This species was remarked by Michaux to grow on uplands, in the colder and more northern districts, and in low, moist ground, as it advanced further south, and he reasoned that this peculiarity was owing to its constitution being better adapted to extreme cold, and that the climate of the United States was too warm for it. In cultivation, however, we have found it to succeed on almost any soil, and in moist, deep soil making immense annual growths of occasionally 5 or 6 feet.

According to Mathew, in Loudon's Arboretum, "The soils suitable for Larch are sound rock, covered with loam; gravel, not ferruginous, in which water does not stagnate, even though nearly bare of vegetable mould; firm dry clays; and sound brown loam—all very rough ground, particularly ravines. The most desirable situation is where the roots will neither be drowned by stagnant water in winter, nor parched by drought in summer."

In regard to the quality of the timber of the American Larch, Michaux says: "It is superior to any species of Pine or Spruce, and unites all the properties which distinguish the European species, being exceedingly strong and singularly durable. In Canada it is considered as

among the most valuable timber, and has no fault except its weight."

2. *L. Dahurica*, Turczaninow.—DAHURIAN LARCH.—Leaves, linear, obtuse, sessile, recurved, spreading, and bright green in color. Branches, irregular and drooping. Cones, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long, oblong-ovate, erect; with small, reflexed, wavy, persistent scales; and short, ovate, pointed bracts. Seeds, very small.

This species, as yet rare in this country, is from Northern Siberia, inhabiting the most rigid and inclement situations in that climate. Gordon gives the following account of its native haunts: "It is found in Northern Siberia, on the bleak mountains of Dahuria, and in the arctic regions of Siberia, a mere little sprawling shrub amongst the last vestiges of arborescent vegetation in those regions; also on cold mountainous places, from the Ural Mountains and Kamtchatka to the Pacific Ocean, but a large tree in Southern Siberia and Russia, and is there what is called the *Archangel Larch*."

The size of this species varies so much with the situation in which it is found that no standard can be given. From the smallest of shrubs, it increases in size as it approaches a milder climate, and there forms a large-sized tree, with irregular, twisted branches, that have a drooping tendency, and are densely supplied with foliage. From the description of this tree given by European writers, we may infer that it is nearly allied to the *L. Europea*, but not so desirable for ornamental purposes as that species. It will, however, be desirable in large collections, as exhibiting a distinct form and manner of growth.

3. *L. Europea*, De Candolle.—EUROPEAN LARCH.—Leaves, 1 inch long, linear, obtuse, flat, soft, numerous, and bright-green in color. Branches, spreading and horizontal, with drooping branchlets. Cones, from 1 inch to $1\frac{1}{4}$ inch long, oval, erect, very persistent, changing from a purplish, to a light brown color with age; scales, orbicular, slightly

reflexed; bracts, somewhat protruding beyond the scales.

Seeds, quite small, irregularly ovate, with a broad wing. Cotyledons, 5 to 7.



Fig. 30.—*LARIX EUROPEA*.

forming quite large trees from 80 to 100 feet in height, and disappearing altogether in a warmer climate.

Our remarks on the genus apply so well to this particular species, which indeed appears to be the type of it, that but little more is now requisite in regard to it. It is far preferable for ornamental planting to the American Larch, being more dense and compact in growth, more pleasing in the color of its foliage, and less objectionable on account of the multiplicity of persistent cones, that so disfigure the appearance of the latter.

The European Larch is found very abundantly throughout the central portions of Europe, and especially on many portions of the Alps, at very high elevations, where it is frequently met with as a low straggling shrub; but in proper situations,

It appears to have no marked preference in regard to soils, excepting that it be not on either of the extremes of wet or dry, and we have seen fine specimens growing in a heavy clay as well as on a light and gravelly loam; but of the two we would decidedly choose the latter as being more conducive to health and rapidity of growth.

Loudon devotes several pages in his "Arboretum" to the description of this species, and mentions a number of instances, illustrating the value of its timber, and the zeal displayed in its cultivation for that purpose in England and Scotland.

A large number of varieties have been advertised by dealers, and quoted by writers, but they so nearly resemble the species as scarcely to be worthy of perpetuation. The best of these is undoubtedly the

Var. pendula, Loudon.—A very handsome and graceful plant, that, when grafted on a tall stem, becomes a pleasing addition to our collections. We have grown it for several years, and can fully endorse the many encomiums given it by other writers. The long, slender limbs frequently reach to the ground.

Var. laxa, Lawson.—According to Lawson, this variety may readily be distinguished from the species by its more rapid growth, more horizontal and less crowded branches, and by the darker green or somewhat glaucous color of the foliage. The branches are also larger, thinner, more graceful, and pendent with age, and the cones are somewhat distinct.

Var. compacta, Lawson.—Gordon classes with those "of only trivial account," but Loudon describes it at some length, as having its branches remarkably thickly interwoven with one another; with thick, rugged, or scaly bark; very distinct cones, and grassy-green foliage. Growth, very slow.

Var. repens, Lawson.—"A tree," says Loudon, "with

this name, in the Horticultural Society's Garden, received from Lord De Roos, has a tendency to extend its lower branches along the ground, rather more than the Common Larch. It is of luxuriant growth, and from its leaves and cones evidently belongs to the *L. Europea*."

Var. Killermannii, Gordon.—Is described as "a dwarf monstrosity, with remarkably thickened branches, densely clothed with leaves." He classes it with those varieties of no account.

Var. flore alba and var. flore rubro, Endlicher.—Are distinguished from the species by the former producing white flowers, and the latter those of a red or pinkish hue.

4. L. Griffithiana, Hooker.—SIKKIM LARCH.—Leaves, from 1 to $1\frac{1}{4}$ inch long, spreading, narrow, linear, light glaucous green color. Branches, irregular, spreading, and drooping. Cones, $2\frac{1}{2}$ inches long, oblong-cylindrical, slightly incurved, sessile, very resinous, reddish-purple when young; scales, very numerous, broad, uneven, rounded; bracts, nearly or quite as long as the scales. Seeds, angular, with a broad, brown wing.

This new species was discovered by Dr. Hooker, growing in Bhotan, Sikkim, and Nepal. It varies very considerably in size with the elevation at which it is found, ranging as it does from 6,000 to 12,000 feet of altitude.

In the former elevation, this species is occasionally seen 60 feet in height; but in the latter, at the snow line, it becomes dwarf and stunted in growth. In some portions of Sikkim it is very abundant, but chiefly growing singly, and rarely in groups.

"The Sikkim Larch," says Dr. Hooker, "forms an elegant, sprawling branched tree, with the branches standing out awkwardly, and often drooping suddenly." This discouraging character, however, is lost sight of during the autumn, when the foliage changes to a bright red color, thus forming a splendid contrast to other Conifers,

We are not aware that this tree has been introduced into this country, and therefore cannot judge of its character, but presume it will never be popular here, as the common European Larch is so perfect in shape that it would be impossible to supersede it by one much inferior in habit of growth, even though it had the questionable merit of being new and rare.

5. *L. Ledebourii*, Ruprecht. — ALTAIAN LARCH.—Syn. *L. intermedia*, Lawson; *L. Sibirica*, Ledebour.—“Leaves, single, or in bundles of many together round a central bud, but mostly single on the leading shoots and young plants, soft, linear, broad, and rather flat on vigorous young plants, but on older ones rather four-sided, obtuse, and with much longer and broader foliage than the common Larch, and darker green. Branches, robust, but not numerous, and pendent. Cones, very small, erect, slender, and rather loose. Scales, oval, with the margins entire, convex, and persistent. Seeds, very small.”—Gordon.

The authority whose description we have quoted states that it is “a tall, luxuriant tree, similar to the common Larch in appearance, but with very much smaller cones, and much longer and broader foliage, growing 80 feet high, at elevations of from 2,500 to 5,000 feet on the Altai mountains in Siberia.”

Loudon thus records Lawson’s description. It “seems naturally possessed of a very strong, luxuriant habit of growth, with pendulous branches and very large leaves; but, like many more Siberian or northern Continental plants, it produces its leaves on the first approach of spring, and is therefore very liable to be injured by the cold, changeable weather to which this country in the earlier part of the season is so liable.”

It was introduced into cultivation in England about the year 1816.

6. *L. occidentalis*, Nuttall. — WESTERN LARCH.—Leaves, shorter and thicker than the European Larch, quite rigid,

pungent at the points, a double channel above and below, partly tetragonal, (Nuttall.) Leaves, long, narrowly linear, thin carinated above and below, more slender and delicate than those of any other species, light yellowish green, (Newberry.) Branches short and small. Cones, ovoid, $1\frac{1}{4}$ inch long, reflexed; scales shortly ovoid, truncated or broadly emarginate, edges thin, membranaceous; bracts half an inch long, imperfectly elliptical, fringed, terminating in a long awn.

This species was first detected by Nuttall, on the western slopes of the Rocky Mountains towards the Oregon. A very closely allied form, differing only in the leaves, was afterwards found by Dr. Newberry, and although with some misgivings described under the same title. The latter discoverer "first met with this Larch on the Des Chutes River, near its head, lat. $43^{\circ} 40' N.$; from that point it extends northward to, and beyond, the Columbia." "It grows scattered along the borders of the streams, rising to a height of 150 feet, with a diameter at base of 2 or 3 feet."

We do not think this species is in cultivation, but have no doubt but what it would prove entirely successful with us in the Middle States.



NEW SPECIES OF LARIX.

7. *L. Japonica*, Murray.—JAPAN LARCH.—"Closely allied to *L. leptolepis*, but differing in the following particulars, viz.: The leaves are longer, being from 10 to 18 lines in length. Pulvini, not equally thick throughout, reddish-brown. Cones, smaller, the ordinary size being 8 or 9 lines in length, and 5 in diameter. Scales, very concave, disposed in 5 rows, instead of 8 rows, which from Siebold's figure, appears to be the number on *L. leptolepis*, and about 25 in number. Bracts, elongated and truncate, with a projecting tooth at the apex. Seeds and wings,

smaller, viz.: from 2 to $3\frac{1}{2}$ lines in length, and the wing much wider, and more pyramidal in shape, and with the seed placed at an angle with the wing."—*Murray*.

Murray points out the difference between this species and the other Larches, founding his distinction principally on the scales of the cones, and adds: "This species was found by Mr. Veitch, on Mount Fusi Yama, at an elevation of from 8,000 to 8,500 feet, and he mentions that it is remarkable as being the tree which grows at the greatest elevation on that mountain. At these high elevations it becomes a stunted bush, no higher than $1\frac{1}{2}$ or 2 feet."

8. *L. leptolepis*, Siebold.—Syn. *L. Conifera*, *Kæmpfer*; *Pinus Larix*, *Thunberg*; *Pinus Kæmpferi*, *Lambert*; *Abies leptolepis*, *Siebold*, *Zuccarini*, *Lindley*, and *Veitch*; *Pinus leptolepis*, *Endlicher*; *Larix Japonica*, *Carriere*.—Leaves, from $\frac{3}{4}$ to $1\frac{1}{2}$ inch long, deciduous, linear, aciculate, mucronate, mostly obtuse, sub-petiolate, soft, slightly recurved, pale green color. Cones, about 16 lines in length, 8 lines in diameter, numerous, ovate, obtuse, with about 60 scales; scales, alternately and closely imbricated, orbiculate, attenuated, thin, flat, truncate, or emarginate, reflexed, and pale brown color; bracts, lanceolate, acute, entire, membranaceous, one-half the length of the scale. Seeds, obovate, rather compressed, sub-trigonal, with a long, obtuse, membranaceous wing.

This Larch resembles our common species in many particulars, but is more slender, and has glabrous, dark-yellowish, ash-colored branches, and stiffly spreading branchlets. It grows to the height of 40 feet, and produces a rough, reddish-brown timber. The following is from *Siebold's* account of this tree:

"The *Fuzi-Matsu* belongs to the northern Flora of Japan. It is found in the mountains of Nippon, between the 35th and the 41st degrees of north latitude. But still more frequently on Jezo, and in the southern parts of Krafu, thus reaching, we may presume, so far as 48° of north latitude. Perhaps it may extend much beyond

that towards the north, like the Siberian Larch, which, according to Pallas, does not entirely disappear, until it reaches 68° north latitude.

"We, as well as Mr. Thunberg, have found it in the Fakone Mountains, where it grows either isolated or in small groups, in company with other Conifers, as well as with Oaks and Beeches. As to its exterior, it in every respect resembles our European Larch, from which, however, it is readily distinguished by its cones being more rounded, and with a much greater number of scales, which are smaller, and turned back at the margin."

The great number of synonyms attached to this species plainly shows the perplexity different authorities have found in assigning it its true position. Murray states that he at first supposed the *Larix Japonica* was only a lesser variety of this, but he is now convinced that he was not warranted in so doing, and that *L. Japonica* is a distinct species.

9. L. Lyalli, Pallatore in Gard. Chronicle.—"A tree found on the eastern slope of the Rocky Mountains, in the Cascade and Galton Ranges, by Mr. Lyall, at about 49° N. lat., and at an elevation above the sea of between 6,000 and 7,000 feet. A remarkable species because of the cobweb-like wool that clothes the leaf buds and young shoots, and the long fringe of the scales of the former. The tree grows from 36 to 45 feet high, and is therefore much dwarfer than the allied *L. occidentalis*, which is also different in the number of leaves in a cluster, their direction and form, and in the cones."

8.—PSEUDOLARIX, Gordon.—FALSE LARCH.

Cones, oblong, erect. Scales, divergent, extended at the points, heart-shaped at the base, very deciduous. Seeds, irregularly shaped, with a soft, thin, whitish, skin-like

covering, more or less enclosed by the wing, but free, and full of turpentine. Leaves, much as in *Larix*.

1. *Pseudolarix Kämpferi*, Gordon.—GOLDEN PINE.—Syn. *Abies Kämpferi*, *Lambert*.—Leaves, from 1 to $2\frac{1}{2}$ inches long, and from $\frac{1}{2}$ to 1 line broad, deciduous, flat, linear, sabre-shaped, somewhat soft, and of a delicate, pale, pea-green color when young, in autumn of a golden yellow.



Fig. 31.—PSEUDOLARIX KÄMPFERI.

Cones, 3 inches long, $2\frac{1}{4}$ inches in diameter, erect, with ligneous, flattish, divergent, very deciduous scales; bracts, small, acute, keeled on the back, and slightly serrulated on the margins. Seeds and wings, glossy bright brown, exactly the same size and shape of the scales, occupying the whole of their inner surface. Cotyledons, from 5 to 7.

Murray says: "This species will enter into none of the

older sections of the genus *Abies*, and, therefore, on the whole, we think Mr. Gordon is justified in having established another subsection to receive it, although we wish he had given it some other name. It will not rank with any of Endlicher's sections, *Tsuga*, *Abies*, or *Larix*, because the scales of its cone are not persistent; and it will not rank with *Cedrus*, because its leaves are deciduous; nor with *Picea*, because they are not solitary, nor persistent."

The following extracts are from Fortune's description: "I have been acquainted with this interesting tree for several years in China, but only in gardens, and as a pot plant in a dwarf state. The Chinese, by their favorite system of dwarfing, contrive to make it, when only a foot and a half or two feet high, have all the characters of an aged Cedar of Lebanon. It is called by them the *Kin-le-sung*, or Golden Pine, probably from the rich yellow appearance which the ripened leaves and cones assume during the autumn."

Speaking of the first specimens he met with, the same author says: "They were growing in the vicinity of a Buddhist monastery, in the western part of the province of Chekiang, at an elevation of 1,000 or 1,500 feet above the level of the sea. Their stems measured fully 5 feet in circumference, 2 feet from the ground, and carried this size with a slight diminution to the height of 50 feet, that being the height of the lower branches. The total height I estimated about 120 or 130 feet. The stems were perfectly straight throughout, the branches symmetrical, slightly inclined to the horizontal form, and having the appearance of something between the Cedar and Larch."

The seeds of this new Conifer germinate so readily that it is almost impossible to carry them any great distance after being perfectly ripened. The Gardener's Chronicle says: "If the seeds of this species are cut open when they are ripe, the little germ will be observed in a green and growing condition, and this circumstance will readily ac-

count for the difficulty which is felt in getting home seed of this fine species in good order," and recommends gathering such seeds before they are fully ripe.

During a recent visit to the collection of H. W. Sargent, Esq., at Wodenethe, on the Hudson, we noticed one or two fine young specimens of this species, that gave evidence of successful treatment, and may probably prove hardy in that locality. Near Boston, it has succeeded for several years.



9.—**ARAUCARIA**, *Jussieu*.

Leaves, imbricated, persistent, and scale-like. Strobiles, terminal and globular, with mostly deciduous scales; the ovule, generally solitary, joined to the scales. Pollen of the sterile aments, contained in from 10 to 20 cases, pendent from the apex of the scale.

The *Araucarias* are from Australia, Polynesia, Brazil, and Chili, where they form large trees, often 150 and 200 feet in height, and occasionally constituting immense forests. They are all exceedingly beautiful, and were they hardy with us, would have an unprecedented popularity.

Their scale-like, imbricated leaves remaining on the plant for years, are of the most charming shade of green; and the straight body of the tree, and its regular conical form, are remarkably pleasing. So rapid is their growth and so succulent their nature, that our climate in the Northern States is not adapted to them; and with the exception described below, this superb genus must be grown in a warmer and more congenial climate. For conservatories, however, many of these species form most conspicuous objects, and they thrive under glass with tropical luxuriance.

The smooth, nut-like seeds produced by most of the species are edible and nutritious, and are often two inches in length. The resin extracted from the trunk of the trees is generally fragrant and valuable; that furnished by the *A. Braziliensis* is incorporated with wax and made into candles. The timber of many of the species is fine-grained, durable, and valuable for building purposes.

This genus is one of the oldest of the order, as well preserved specimens of a handsome species have been discovered in the coal formations of Europe; and although entirely extinct in a living state at the present time, the name of *A. primæva* has been given it.

The Araucarias differ from the most of the Pine subfamily in being dioecious, and principally on this account have, with the Dammara and others, been formed into a distinct sub-order by some writers. The name of the genus is derived from a tribe of Chilians called Araucanos, who use the seeds of the *A. imbricata* as their principal article of food.

1. *A. imbricata*, Pavon.—CHILI PINE.—Leaves, varying from $\frac{3}{4}$ to $1\frac{3}{4}$ inch long, ovate-lanceolate, sessile, rigid, straight, sharply acute, very persistent, closely imbricated, arranged in whorls or verticils of 7 or 8, deep glossy-green color. Branches, horizontal, ascending at their extremities, in whorls of 6, 7, or 8, and covered with a resinous, corky bark. Cones, from 7 to $7\frac{1}{2}$ inches long, and 8 to $8\frac{1}{2}$ inches broad, roundish-ovate, erect, solitary; with numerous, deciduous, recurved, wedge-shaped, large scales. Seeds, wedge-shaped, from 1 to 2 inches long; thick, hard testa; and short, obsolete wings.

This very handsome species is from the Andes of South America, between 36° and 46° south latitude, and occurs in such abundance as to form large forests; in many places covering whole sides of the mountain from the base to the snow line. It is most frequently found on dry, rocky eminences almost destitute of water.

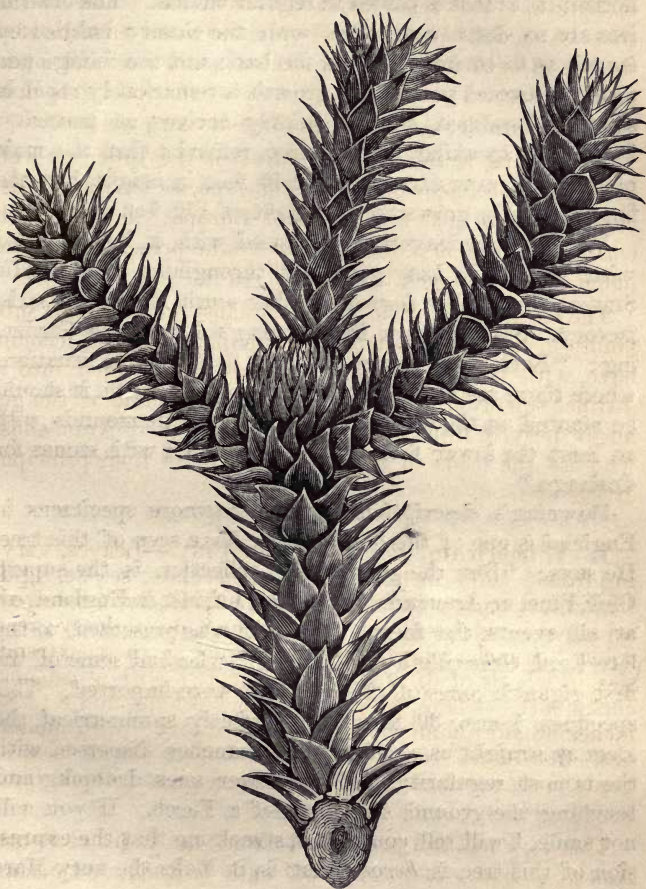


Fig. 32.—*ARAUCARIA IMBRICATA*.

The Chili Pine forms a tall, straight tree, with a maximum height of 150 feet. The shape is perfectly conical, with horizontal branches placed in regular whorls. The branchlets are so densely crowded with the closely imbricated leaves as to entirely conceal the bark, and the foliage persists for several years. Its growth is remarkably rapid in suitable localities, and it quickly arrives at maturity. Pavon, in speaking of this tree, remarks that the male plant rarely ever exceeds 40 or 50 feet in height, but the female usually grows to the height of 150 feet.

We have endeavored to succeed with it, but it failed with us, as it has generally throughout the Middle States; but a few degrees further south it is quite satisfactory. Sargent says in Downing's Landscape Gardening: "Both sun and wet are fatal to it, and in situations where there are no hill-sides sloping to the north, it should be planted on the north of buildings on little mounds, with at least the lower foot in the holes filled with stones for drainage."

Downing's description of the Dropmore specimens in England is one of the best that we have seen of this tree. He says: "But the gem of the collection is the superb Chili Pine, or Araucaria, the oldest, I think, in England, or, at all events, the finest. The seed was presented to the late Lord Grenville by William IV, who had some of the first gigantic cones of this tree that were imported. This specimen is now 30 feet high, perfectly symmetrical, the stem as straight as a column, the branches dispersed with the utmost regularity, and the lower ones drooping and touching the ground like those of a Larch. If you will not smile, I will tell you that it struck me that the expression of this tree is *heroic*, that is, it looks the very Mars of evergreens.

"There are no slender twigs, no small branches, but a great stem with branches like a colossal bronze candelabrum, or perhaps the whole reminds one more of some

gigantic, dark green coral, than a living, flexible tree. Yet it is a grand object,—in its richness of dark green, its noble aspect, and its powerful, defiant attitude. This is quite the best specimen that I have seen, and stands in a light sandy soil, on a gravelly bottom, on which soil I was told it only grows luxuriantly.”

Var. variegata, Gordon.—“A very striking variety with pale, straw-colored leaves, and occasionally the young shoots intermixed with the ordinary deep shining green ones. It originated in Mr. Glendinning’s nursery, at Furnham Green, and is quite unique.”

Not yet introduced into this country to our knowledge.



TENDER SPECIES OF ARAUCARIA.

These beautiful trees form one of the most ornamental features in our collections when grown in large tubs or boxes, and placed under glass during the winter months. With the exception of *A. excelsa*, they will all probably succeed well in the open air in the extreme Southern States. They are not hardy in England, but are grown extensively for decorative purposes.

2. *A. Bidwillii*, Hooker.—**BIDWILL’S ARAUCARIA.**—This is a splendid tree, growing from 100 to 150 feet in height, with an even, although rather loose, conical head, and producing very fine-grained, durable wood, and large, nut-like fruit over 2 inches in length. The cones are about 9 inches in length, of a globular form, inclining somewhat to oval; with the scales terminating in a stout, recurved hook or sharp point. It is a native of Australia.

3. *A. Brasiliana*, Richard.—**BRAZILIAN ARAUCARIA.**—

Smaller than the preceding, not exceeding 70 or 100 feet in height, but strikingly beautiful in all its parts. It is from the section of country north of Rio Janeiro, and was introduced into England in 1819. It is more tender than *A. imbricata*, but a much more rapid grower than that species. The large, sessile cones are about 6 inches in diameter, with the scales ending in sharp spines. The seeds are produced singly and are about 2 inches long.

Var. *Ridolfiana*, Savi.—This form is more robust in growth, with larger and longer leaves, and probably more hardy than the species.

Var. *gracilis*, Carriere.—This variety is the exact reverse of the above, and has bright green leaves when young, and in its general appearance closely resembles the *Cunninghamia Sinensis*. Branches undivided and drooping at the extremities.

4. ***A. Cookii*, Brown.**—Is from the islands of Aniteura, New Hebrides, and New Caledonia. It grows to the height of from 150 to 200 feet. The branches are placed in very regular whorls, horizontal in growth, and very densely clothed with leaves. Cones smaller than either of the preceding.

5. ***A. Cunninghamii*, Aiton.**—MORETON BAY PINE.—From Moreton Bay and elsewhere in Australia, where it constitutes whole forests, frequently growing to the height of from 100 to 130 feet. The form of this species is not so compact as some others, but its beautiful, dark, glossy-green leaves are very attractive. It produces the smallest cones of the genus.

Var. *glauca*, Antoine.—Differs from the species in having glaucous leaves. Said to be very striking.

Var. *longifolia*, Antoine.—The foliage is longer and straighter than the usual form, and it is robust.

6. *A. excelsa*, *Brown*.—NORFOLK ISLAND PINE.—The most tender species, but growing much larger than the others, almost rivalling in grandeur the “Giant Trees of California.” Specimens have been measured that were 225 feet in height, with trunks 11 feet in diameter, and entirely destitute of branches to the height of 80 or 100 feet. The branches are in regular whorls, and the globular cones are about 6 inches in diameter, and produce very large seeds.

7. *A. Rulei*, *Mueller*.—Another of the newer Australian species that is quite tender in England. It forms a dense, compact tree about 50 feet in height, with very numerous, closely imbricated, dark glossy-green leaves, and very large, globular cones, having broad scales, terminating in narrow, lance-shaped projections or points an inch long.



10.—DAMMARA, *Rumphius*.

Diœcious, having globular, axillary cones, and solitary, coriaceous, persistent leaves. The carpellary scales are devoid of bracts; the ovules solitary, and not adherent to their base. According to Gordon there are five known species, and three that are uncertain.

We note this tender genus and the following to warn those who may be disposed to try them of their true character, as well as to give those who wish to grow them under glass a list of the species, with some indications of their character. The descriptions of these will necessarily be brief.

1. *D. australis*, *Lambert*.—Is a tree from 120 to 150 feet high, and a native of New Zealand.

2. *D. macrophylla*, *Lindley*.—Grows 100 feet high, and comes from one of the South Sea Islands.

3. *D. Moori*, *Lindley*.—Is about 40 feet in height; from New Caledonia.

4. *D. obtusa*, *Lindley*.—Forms a large tree 200 feet high, and was introduced from the Island of Aniteura, one of the New Hebrides group.

5. *D. orientalis*, *Lambert*.—Is a huge tree 100 feet high, from Java and Borneo. "This species," according to the Botanical Magazine, "is perhaps the rarest of all Coniferæ cultivated in Europe."

Var. glauca is recently introduced, and is represented as having very glaucous leaves.

Var. alba, *Knight*.—Has whitish bark and longer leaves.

The three new and uncertain species are *D. vitiensis*, *Seemann*; *D. ovata*, *Moore*; *D. longifolia*, *Lindley*.



11.—**ARTHROTAXIS**, *Don*.—THE JOINTED YEW.

Small, diœcious, evergreen plants from Van Diemen's Land. The flowers are all terminal and solitary, and the small, globular cones composed of imbricated, entire scales, and destitute of bracts. From 3 to 5 ovules under each scale. The name is derived from the curious arrangement of the jointed shoots.

The genus comprises but three known species.

1. *A. cupressoides*, *Don.*—Forms a tree about 30 feet in height, with numerous, slender, spreading branches.

2. *A. laxifolia*, *Hooker.*—A small tree of which but little is known.

3. *A. selaginoides*, *Don.*—Forms a handsome, spreading bush with numerous branches, densely clothed with deep green glossy leaves.

CHAPTER XI.

THE CYPRESS SUB-FAMILY.—CUPRESSINEÆ.

The engraving, figure 33, gives magnified drawings of the flowers and fruit of the common Juniper, and illustrates the characters of the sub-family Cupressineæ. The sterile aments are shown of the natural size, at *a*; *b* shows one of these much enlarged; and *c* gives a view of one of the stamens. The fertile aments, *d*, one of which is shown enlarged at *e*, consist of a few scales; at the base of the scales are borne the erect ovules, as seen in the magnified cross section, *f*. The scales in the Juniper become fleshy and form a berry-like fruit, of which *g* represents the young, and *h*, the mature state, both enlarged. A cross section of the fruit is shown at *i*, exposing the seeds, a separate one of which, with the glands at its base, is represented at *j*.

12.—JUNIPERUS, *Linnaeus*.—JUNIPER.

Flowers chiefly diœcious, very rarely monœcious; sterile aments, sub-terminal or axillary, anther cells on the under side of the shield-shaped scales, opening lengthwise, and from 3 to 6 in number; fertile aments axillary, ovoid, and bracteate at base. Fruit, a scaly-bracted drupe, in some species resembling a berry, emitting a strong, resinous odor, and containing from 1 to 3, erect, hard-shelled seeds. Cotyledons, 2. Leaves, scale-like, subulate or lanceolate, persistent and rigid.

This immense genus of evergreens is one of the most useful of the order for ornamental planting. It comprises

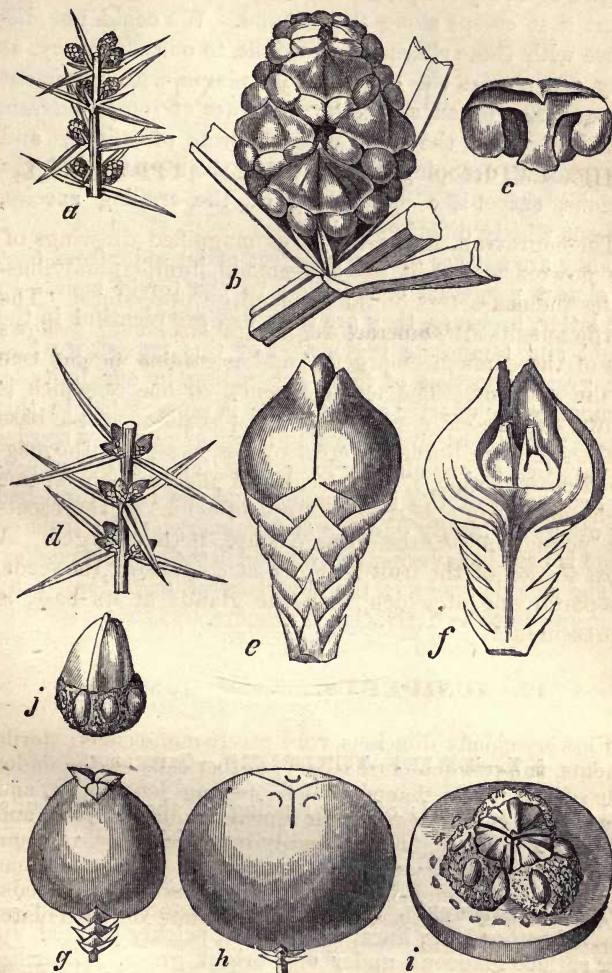


Fig. 33.—FLOWERS AND FRUIT OF JUNIPERUS COMMUNIS, TO ILLUSTRATE THE STRUCTURE OF THE SUB-FAMILY CUPRESSINEÆ.

species of every size, from the largest class to the trailing plant that creeps along the ground. We could not dispense with these charming additions to our shrubbery, as they are almost the only reliable plants with persistent leaves. The broad, spreading character of some contrasts beautifully with the rigid conical forms of others; and the graceful, drooping branchlets of the *weepers*, and the curious, carpet-like appearance of the trailing species, present widely differing forms.

They are natives of every degree of latitude, from that of almost perpetual congelation to the torrid zone. In the latter, however, they are rare, but are plentiful in the frigid and temperate regions. For this reason, we find the greater portion of them succeeding in our latitude. Almost every quarter of the globe is represented in this genus, and almost every year adds one or more new species or varieties to our already long list. The lumber of several species is of the best quality, and the resin furnished by others is highly odorous and valuable. The fruit of some is used in flavoring liquors, and in the materia medica.

The generic name is the old classical one adopted by Linnæus, but the derivation is obscure.



§ I.—TRUE JUNIPERS.—OXYCEDRUS.

Leaves in whorls of 3, spreading in the adult plants, jointed at the base, and glandless on the back. Fruit globular and smooth.

1. *J. communis*, *Linnæus*.—COMMON JUNIPER.—Leaves rather long, linear awl-shaped, prickly pointed, upper surface glaucous, under one bright green. Branches ascending or spreading, rigid, with numerous branchlets. Fruit small, globular, dark purple, covered with a handsome light bloom. For flowers and fruit see figure 33.



Fig. 34.—JUNIPERUS COMMUNIS.

The Common Juniper is a native of North America, Europe, and Asia. In this country its limits extend from New Jersey and Pennsylvania, northward into Canada, and in Europe it is found throughout the most northern portions, and is particularly plentiful on the Alps and Apennines.

The Common Juniper varies from 5 to 10 feet in height, and in cultivation frequently grows much larger. Its branches are usually numerous and erect, although more or less straggling in growth, frequently spreading and forming a sprawling bush. This tendency to spread causes the shape of the plant to be injured by heavy masses of snow lodging in the centre. A few wires drawn tightly around the main branches is a sure preventive. The outline should also be preserved perfectly symmetrical by shearing off all superabundant growth, and thus cause the plant to become more dense and compact.

We have noticed the frequent use of this Juniper for a hedge-plant, but it is unfit for this purpose. The lower branches are apt to die out, thus presenting an unhand-some appearance at the base, and during cold winters the immature branchlets are occasionally destroyed. Indeed all of the genus are more or less liable to the objection of *dying out*, not even excepting our Red Cedar, (*J. Virginiana*); and we recommend planting for hedges the Arbor Vitæ and Hemlock Spruce in preference to any of the Junipers.

Adult plants of this species will occasionally form quite large trees. The Bartram specimen, according to Meehan's "Hand-book of Ornamental Trees," is "35 feet high, and 2½ feet in circumference. It is growing on a dry loam with a gravelly subsoil, which seems to suit it admirably."

Scarcely any plant is so liable to assume a multiplicity of shapes as this. We have seen a large number of young seedlings in nursery rows, where scarcely two were alike in every particular. Occasionally they present a tall, erect

form, almost equalling the Irish Juniper, and again spreading and straggling in a very unsymmetrical manner. We have also noticed specimens with horizontal branches, in which the outline of the plant was spherical; but this latter form is not of frequent occurrence.

Gin receives its flavor from the drupe-like berries of this species, and the oil extracted from them is also used in medicine.

Var. Alpina, Linn.—Syn. *J. Canadensis, Loddiges*; *J. communis depressa, Pursh*; var. *Canadensis, Loudon*.—This is a creeping or rather a low spreading plant, extending along the surface of the ground often to the distance of 7 or 8 feet, in every direction. The extremities of the branches are usually ascending, but rarely to a greater height than three feet. The foliage is very handsome, and presents an agreeable contrast to the darker hues of *J. prostrata* when growing near each other, as they are frequently placed in ornamental grounds.

It is principally found along the lakes on our northern boundary, and is more or less common throughout Canada and farther north.

For ornamenting rock-work, this plant is well adapted; its creeping habit, united with a strong, vigorous growth, making it particularly useful in such situations. We have seen an artificial rockery covered with this plant and the *J. prostrata*, which we considered the most charming feature in the collection where it was grown.

Specimens of this variety when growing wild are often remarkably beautiful; and this is particularly the case along the Niagara River.

On Goat Island, as well as on the opposite shore, this hardy little plant flourishes amid the spray, and enlivens the winter landscape by its peculiar silvery tints.

Var. Hibernica, Loddiges.—IRISH JUNIPER.—This is decidedly the most distinct and beautiful of all the vari-

eties of our Common Juniper. It is very formal and erect in growth, resembling a green column, and generally attaining about the same height as the species, but with a much more dense and compact habit of growth. For suitable localities, especially in formal or architectural gardens and avenues, this fine variety is of the highest importance; but for general and promiscuous planting on a highly cultivated lawn, it is decidedly out of place.

During excessively cold winters this variety is liable to be injured in this latitude, particularly in the young and imperfectly matured shoots; but we think this is not so frequently the case when it is growing in a good, well-drained soil—not sandy, however, for the Irish Juniper requires a rather moist and somewhat generous soil to ensure a full development.

A form of this variety with prettily variegated leaves has been raised at Handsworth, England.

Var. Suecica, Loudon.—SWEDISH JUNIPER.—A native of the north of Europe, and is remarkably hardy and useful with us. The foliage is a light yellowish-green color, smaller, and more scattered than in the species. It, however, forms a much larger tree, and produces larger fruit.

Loudon, in speaking of the Swedish Juniper, observes that “this kind was supposed by Miller to be a species, because he found it always come true from seed. It generally attains the height of 10 feet or 12 feet, and sometimes of 16 feet or 18 feet. The branches are more erect than those of the Common Juniper; the leaves are narrower, they end in more acute points, and are placed farther asunder on the branches; the berries are also larger and longer.” This author calls it *J. communis fastigiata*. Gordon mentions that it has attained the height of 50 feet in the forest of Fontainebleau, France.

Var. compressa, Carriere.—SPANISH JUNIPER.—Resembles the Irish Juniper in form, but it is even more

dense in habit, with shorter and more numerous leaves than that variety. We are unable to speak from our own experience in regard to its hardiness, but according to Sargent it is perfectly hardy and fine, and if we mistake not, it succeeds at Flushing, L. I.

Var. pendula, Reid.—This variety, although not very distinct, deserves a place on our lawns; for with proper care in training and pruning, it makes a fine specimen. The branchlets have a drooping tendency. It originated at Elizabethtown, N. J., in the collection of the late Wm. Reid.

2. J. drupacea, Labill.—PLUM-FRUITED JUNIPER.—Leaves rather large, linear-lanceolate, spreading, very acute, concave and glaucous above, convex and light green below. Branches spreading. Fruit, very large, frequently 1 inch in diameter, roundish-ovate, axillary, solitary, dark purplish color, with a handsome bloom.

This rare species is almost unknown to cultivators in this country, but is well deserving of cultivation. We have had an opportunity of testing it fully for several years, and have proven its adaptability to our climate.

It is a native of the colder parts of Syria, where it generally attains the height of from 8 to 10 feet, but occasionally forms quite a good-sized tree. The branches are very numerous and spreading, and the general form of the plant a regular cone. With us the fruit is not so large as that described by foreign authors. Gordon speaks of it in England as quite hardy, and the finest of all the Junipers; and we trust it will receive more attention in the future with us, as our list of evergreen shrubs is so small that we cannot afford to dispense with one so valuable as this.

3. J. hemisphærica, Presl.—HEDGE-HOG, OR GLOBULAR JUNIPER.—Syn. *J. echinoformis, Rinz*; *J. Oxycedrus echinoformis, Van Houtte's Catalogue.*—Leaves medium

length or small, awl-shaped, exceedingly acute, spreading, very numerous, glaucous above, light green below. Branches and branchlets very numerous, crowded. Fruit spherical, glossy, bright red color.

This curious little plant, as its specific name implies, forms a complete hemisphere, and usually measures from one to two feet in diameter. The branches are very numerous, crowded, quite small; and the branchlets are so dense and thickly covered with leaves as to make a complete mass of sharp, awl-shaped points, extending out in every direction.

Our specimen is now ten years old, and is but one foot in diameter; it has nevertheless been remarkably healthy, and has sustained its lively green hue through the vicissitudes of a changeable climate, never altering its color, even in the coldest winters or during the most severe droughts. Its odd appearance has caused the name of Hedge-hog Juniper to be applied to it; and although rather inelegant for so pretty a little plant as this, it is certainly very expressive.

It is a native of the sterile sides of Mt. Etna, where it flourishes in a barren soil beneath an almost scorching sun. It is also occasionally found in the mountainous regions of Calabria.

We have seen this plant used in cemeteries, where it appeared very appropriate and created a pretty effect, especially in a small, enclosed lot. When this species is associated with the trailing Junipers, such as *J. prostrata*, or *J. squamata*, the effect is visibly heightened.

4. *J. macrocarpa*, Sibthorp.—**LARGE-FRUITED JUNIPER.**—Syn. *J. elliptica*, *Van Houtte*.—Leaves rather large, lanceolate, very acute, glaucous above, light green below. Branches, somewhat upright, with slender, drooping branchlets. Fruit very large, nearly elliptical, dark purple color, and covered with a beautiful light bloom.

This fine shrub, although closely resembling *J. Oxyce-*

drus in appearance, and especially in the form and color of its leaves, is, notwithstanding, quite distinct in its fruit, and is also much less hardy with us, but is one of the most beautiful of the family. In England it is pronounced entirely hardy, and is considered very desirable; but our experience with it has been so variable and unsatisfactory that we cannot recommend it, excepting for trial under very favorable circumstances.

Along the shores of the Mediterranean, on dry, sandy soils, this species flourishes in great luxuriance. In several portions of Greece it is abundant, especially in rocky localities. It generally grows from 6 to 10 feet in height, and forms a conical outline, with the young branchlets drooping quite gracefully. Spach considered it as a variety of the *J. communis*.

5. *J. oblonga*, Bieberstein.—OBLONG-FRUITED, OR CAUCASIAN JUNIPER.—Syn. *J. communis oblonga*, Loudon, etc., etc.—Leaves rather long, lanceolate, very acute, rigid, sessile, glaucous green color. Branches spreading, and furnished with numerous drooping branchlets. Fruit small, in clusters or whorls of 3, sessile, dark purple color, with a light bloom.

This species is found principally in Caucasus and Southwest Russia, where it grows to the height of 5 or 6 feet, but frequently forming only a straggling bush, spreading along the ground. The branches are mostly irregularly placed and very crooked, incurved at the apex, but with very pretty, slender, pendent branchlets. The branches are so numerous as to form a dense and compact mass, which serves in a manner to disguise their unmethodical arrangement, and in most cases causes it to form a regular and pleasing outline.

We have found it quite hardy and very distinct from any other species, although nearly resembling the *J. rigida*, to which it is closely allied. In a group of evergreen shrubbery the *J. oblonga* should always have a place, as

the gracefulness of the branchlets imparts a peculiar beauty, unusual in the majority of the genus. It is especially fitted for use in cemeteries, and we have often wondered why so appropriate a plant should be overlooked.

6. *J. Oxycedrus*, *Linncæus*.—PRICKLY CEDAR.—Leaves medium size, lanceolate or awl-shaped, scattered, spreading, light green color. Branches spreading, with pendulous, slender branchlets. Fruit numerous, large, globular, shining, reddish-brown color.

The Prickly Cedar, or, as it is sometimes called, the Large Brown-fruited Juniper, is a small tree from the shores of the Mediterranean, particularly in Spain, Portugal, and France; also on the Apennine Mountains, at a considerable elevation. The usual height is about 10 or 12 feet, but occasionally it is much larger, with long, slender branches that have a somewhat drooping habit.

Its hardiness in our climate is doubtful, but our experience with it has been somewhat limited. It generally, however, survives our winters with an occasional loss of a portion of the young branchlets, which injures the appearance of the plant. During the growing season it is very handsome and quite distinct, owing to the color, form, and arrangement of the leaves. For partially shaded situations in favorable aspects, we would recommend its culture here.

7. *J. rigida*, *Siebold*.—WEEPING, OR RIGID-LEAVED JUNIPER.—Syn. *J. oblonga pendula*, *Loudon*.—Leaves medium length, lanceolate, sessile, rigid, acute, glaucous and concave on the upper side, light green and convex beneath. Branches fastigiate and pendent at the extremities, with numerous flexile, angular, and slender branchlets. Fruit small, oblong or spherical, solitary, short petioled, glaucous violet color.

This species, which has been long known as the *J. oblonga pendula*, or Weeping Juniper of Loudon, is a native

of the mountains of China and Japan, where it attains the height of from 15 to 25 feet.

There can be no doubt of the validity of Siebold's specific name, and that he was correct in considering it a distinct species. The similarity between it and *J. oblonga*, as well as *J. communis*, is entirely superficial; and Loudon named it from its mere resemblance in growth and general appearance to these plants.

It is, however, one of the most beautiful of the family, and should be tested by every admirer of the Coniferæ. The branches are fewer in number, more slender and pendent, and altogether more graceful than those of the *J. oblonga*. It is perhaps scarcely as hardy as the latter species, but requires a few years of care and attention to enable it to become acclimated, the young and tender shoots being liable to injury, not only from the excessive cold of winter, but frequently from the direct rays of our summer's sun.

It grows very rapidly, and soon forms one of the most attractive features in a collection. We have been much pleased with this species when grafted standard high on the Red Cedar; it then assumes an unusually graceful habit. It is remarkably well adapted for cemetery planting.

8. *J. rufescens*, Link.—BROWN-FRUITED JUNIPER.—Syn. *J. communis* Wittmanniana, *Carriere*.—Leaves rather long, lanceolate, spreading, rigid, acute, pale green color. Branches angular and spreading, with long, slender branchlets. Fruit small, spherical, short peduncled, dark reddish-brown color.

A species from the borders of the Mediterranean, and found in most of the countries along the coast. It grows generally about 8 or 10 feet in height, according to the soil and situation, some plants exceeding that size, while others are but small shrubs. We are afraid this Juniper will not prove hardy in the Middle States, as our experience with it has been quite variable. It must consequently

be planted in a sheltered and very favorable spot to secure any chance of success.

Var. brevifolia, Endlicher.—This is no hardier than the species, but is a larger tree, more compact in growth, and has smaller foliage.

§ II.—SAVIN JUNIPERS.—SABINÆ.

Leaves in opposite pairs, mostly awl-shaped, slightly divergent, and loosely imbricated in the adult plants. Fruit mostly small and numerous.

9. J. densa, Gordon.—DENSE-GROWING INDIAN JUNIPER.—Syn. *J. recurva densa*, *Hort*, &c.—Leaves, in whorls of three, half spreading, linear-lanceolate, very acute, pungent, a pale yellowish-green, and about a third of an inch long. Berries solitary, the size and shape of a small pea, dark blue, covered with a glaucous bloom, extremely resinous, aromatic, and mostly three-seeded; with three divergent furrows on the apex, connected at the extremities by an elevated scale, and thus forming a kind of platform on the top, with three lateral scales lower down the sides of the berry. The whole plant emits an exceedingly strong turpentine or resinous smell when bruised, and the berries ripen from August to November.”—*Gordon*.

This species, lately brought into notice under a new name by Gordon in his supplement to the *Pinetum*, had been previously confounded with the *J. recurva*. According to this author, it is very distinct from the latter, being “easily distinguished by its dwarf, dense habit, and small, 3-seeded fruit, while that of *Juniperus recurva* has but a single seed in each berry.” It generally grows from 3 to 6 feet high, somewhat resembling *J. squamata* in appearance, but not so spreading in its growth. The tint of its foliage is of a pale yellowish-green. Gordon enumerates

a number of localities where this species is found. It is plentiful on the Bhotan Alps, and in Kunawur, at different elevations, ranging from 9,500 to 14,000 feet.

We have received plants from Belgium, bearing the foregoing description, under the name of *J. recurva densa*, but as to the character of the fruit, we are unable at present to say. The high elevations at which it is frequently found should encourage us to test it fairly, as it will probably prove very desirable in a collection.

10. *J. excelsa*, Beiberstein.—TALL JUNIPER.—Leaves, small, awl-shaped, very acute, imbricated, thick, rigid, pale glaucous-green color. Branches numerous, spreading, incurved at the extremities, thick, short, with rigid, straight branchlets. Fruit medium size, roundish, solitary, terminal, dark purple color, with a glaucous bloom.

The confusion arising from the fact that there are two distinct plants known as the *J. excelsa*, does not in any way relate to their resemblance, but originated through a misunderstanding on the part of botanists in the East Indies, who claimed the name of *J. excelsa* for the very distinct species now known as *J. religiosa*. So far as we of the Middle States are concerned, the dispute is of very little consequence, both species being entirely too capricious for our climate.

The true *J. excelsa* is but a large-sized shrub with us, whilst in its native locality it forms a tree from 30 to 40 feet in height. It is a native of Southern Europe, and is found in Taurica, Armenia, Syria, etc. The branches are very numerous, spreading and ascending at their extremities, with a profusion of foliage, and furnished with numerous small, stiff branchlets.

Its hardiness is very variable; sometimes it resists our winters with impunity, but it is more frequently killed to the ground. By affording it a slight protection, and placing it in a partially shaded situation, it is sometimes rea-

sonably satisfactory. This species must not be confounded with the *J. excelsa* of Pursh and Lewis, which we find occasionally described as a North American species. Pursh's plant is the *J. occidentalis* of Hooker, and *J. andina* of Nuttall, a very different plant from the one under notice.

Carriere mentions a very pretty variegated variety, in which the leaves and branches are spotted.

11. *J. prostrata*, Persoon.—PROSTRATE JUNIPER.—Syn. *J. procumbens*, Pursh; *J. Sabina prostrata*, Loudon; *J. repens*, Nuttall, &c., &c.—Leaves, short, awl-shaped, acute, loosely imbricated, crowded, dark shining-green color. Branches, trailing, slender, and spreading. Fruit quite small, solitary, nearly globular, very dark purplish color with a glaucous bloom.

This hardy creeping plant is from the northern portions of our continent, extending along the Lakes to north-west America.

Nuttall speaks of finding it along the shores of Lake Huron, and says, "It is a very distinct species, being wholly prostrate, and spreading along the ground in very wide circles." This species is, however, very distinct from the *J. procumbens* of Siebold, as that is but a synonym of the *J. Japonica* of Carriere, and a native of Japan.

Having before alluded to the beauty of this plant, when growing on rockeries with other trailing Conifers, it only remains for us to recommend it in the strongest terms. It is entirely hardy, a remarkably vigorous grower, and with a dark green color. We have seen this plant trained up a stake, when a graceful and pretty effect was produced; and thus, in like manner, it may be made to cover unsightly objects, provided such are not too high. Perhaps the finest specimens in cultivation are those at Princeton, mentioned by Sargent in his edition of Downing's Landscape Gardening. They form a complete mass

of rich green verdure, not exceeding 2 feet in height, and at least 30 feet in circumference.

The destructive little aphides are particularly injurious to these trailing species, and we have noticed whole beds of young plants of the Prostrate Juniper entirely killed by their depredations. A large plant in our own collection, several years of age, was recently destroyed in one season by these pests. The best remedy for ridding the plant of them is to sprinkle the foliage frequently with hot tobacco water, which usually destroys insect life after a few applications.

12. *J. recurva*, Don.—RECURVED-BRANCHED JUNIPER.—Syn. *J. Nepalensis*, *Rinz*; *J. repanda*, *Hort.*—Leaves, medium length, lanceolate, spreading, acute, glaucous-green color. Branches covered with scaly bark, drooping, with pendulous branchlets. Fruit, somewhat oval, shining, very dark purple color, monospermous.

This species is quite distinct from *J. densa*, although the latter, according to the first edition of Gordon, was considered to be the male plant of this species, and known as *J. recurva densa*.

The *J. recurva* is a native of Bhotan and Nepal, where it is found at elevations varying from 9,000 or 10,000 feet to 14,000 or 15,000 feet. In the former it generally grows to the height of 70 or 80 feet, but in the latter it is only a creeping alpine shrub.

It is about equally hardy with the *J. densa*, but not sufficiently so to recommend for general cultivation. Both belong to that class of Conifers which cannot be called exactly half-hardy, but uncertain and unsatisfactory, occasionally succeeding very well, and again becoming browned and severely injured. A partially shaded situation should invariably be given them.

In beauty, this Juniper must certainly be considered unexcelled, and we regret exceedingly that its capricious

nature, or our variable climate rather, will not allow us to enjoy its beauties in perfection. A perfectly healthy specimen is one of the most elegant little trees within our knowledge. There is such an air of gracefulness and lightness in the easy rounded curve of each little branchlet, that it is certain to command the admiration of every lover of the family. Two remarkable characteristics in this species are shown in the rough bark, curling and peeling off, and the very peculiar chaffy adult leaves. These never vary, and readily enable us to distinguish it from all others.

13. *J. religiosa*, Royle.—SACRED OR INCENSE JUNIPER.—Syn. *J. excelsa*, *Madden*, &c., &c.—Leaves, very variable in size and position, the rows occasionally disposed ternately, but mostly quaternate; either acute or somewhat obtuse, imbricated, slender, glaucous, and bright green in color. Branches, irregular, quite numerous, and drooping. Branchlets, drooping and slender. Fruit, small, spherical, aromatic, resinous, smooth, and dark purple in color.

Although this plant is so frequently and unjustifiably confounded with the true *J. excelsa* of Bieberstein, it does not, however, resemble that species in appearance. The name of *J. excelsa* was first given this species by the writers on Indian Conifers, without a knowledge of the fact that another Juniper already claimed the title. The name was, therefore, changed to *J. religiosa* by Royle, which is the correct and only proper name recognized by botanists. It has also been erroneously confounded with *Cupressus torulosa*, which it very slightly resembles, but from which it is widely distinct in fruit and other characters.

The *J. religiosa* is found generally in the mountainous districts of Nepal, Bootan, and Sikkim, at very high elevations, decreasing in size as it approaches the highest limits, until it forms but a small, uninteresting shrub. In the more congenial districts, however, at elevations varying from 7,000 to 12,000 feet, it assumes its greatest dimen-

sions, and is really a magnificent tree, generally attaining a height of from 50 to 75 feet, although Madden mentions a solitary specimen, growing in the neighborhood of one of the Indian temples, that measured 100 feet high, and was 13 feet in circumference, 5 feet from the ground.

The specific name was given on account of the reverence in which it is held in India by the Buddhists. For purposes of incense the young twigs are coated with goats-grease, and burned in the temples on important festive days. The scent of the wood, foliage, and berries, is highly aromatic, but they are exceedingly nauseous to the taste. The wood is of the same color as that of many other species that are used in the manufacture of lead pencils, and would doubtless answer the same purpose, it being of a peculiar cinnamon-red, as well as soft and fine-grained.

Our experience with this species as an ornamental plant is very limited in regard to out-door cultivation, although we have had it in pot culture for several years; but in the collection of H. W. Sargent it is entirely hardy. This tree, when perfectly healthy, and in a suitable locality, grows rapidly, and assumes much the same character that distinguishes the handsome *Cupressus torulosa*. The main body of the tree is straight and smooth, with the branches very numerous, and curving gracefully at the extremities.

14. J. Sabina, *Linnaeus*.—SAVIN JUNIPER.—Leaves, small or medium, oval, awl-shaped, acute, imbricated. Branches, ramified, spreading, with a reddish-brown bark. Fruit, small, oval, or globular, very smooth, dark purple color, mostly monospermous.

A native of the mountains of Europe—on the Alps, Apennines, and Pyrenees; as well as in the northern sections of North America—in Canada, &c. It belongs to the trailing class of Junipers, although an upright form is occasionally met with. The branches are very numerous,

and form a compact, irregular mass; the branches become destitute of foliage as they increase in age and size.

In former years, when the more desirable trailing species

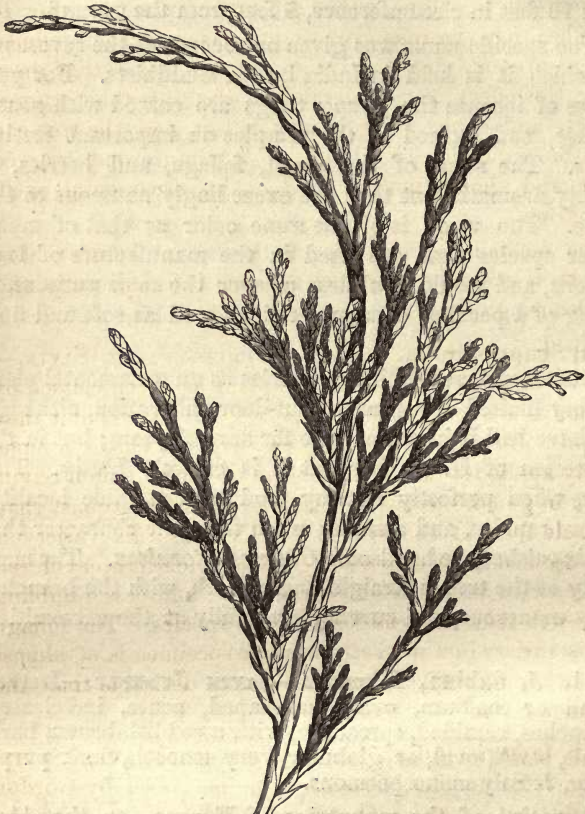


Fig. 35.—*JUNIPERUS SABINA*.

were unknown, the Savin was very generally cultivated for ornament, especially in the topiary work, which for a time was so much the fashion; but, thanks to a more cor-

rect taste, this style of gardening is now almost obsolete. In wild, rocky landscapes, and for covering rough, unsightly features on a lawn, this species may be the means of creating excellent effects; but as a specimen plant, we would not recommend it. True, a bed of young plants, owing to their healthy, vigorous growth, and peculiar, sombre-hued foliage, presents an attractive appearance, but as they grow older, this effect is considerably marred by their ragged aspect, and hence their beauty is lost, and the tree can only be valuable as adding to a picturesque, rugged scene, and should not be used on an ornamental, well-kept lawn.

The medicinal properties of the Savin Juniper have long been known. The ancients used it as a diuretic, and for cleansing ulcers.

Var. *cupressifolia*, Aiton.—CYPRESS-LEAVED SAVIN.—This very distinct and attractive plant has been classed by Gordon as a synonym of the species, but as to habit they are quite distinct. That authority says: "This is a name mostly applied to the female form of the Common Savin, which in general grows much taller and more robust than the male form of the species." With us this variety is very decided in its character, having much lighter colored foliage, with more slender branchlets, and less rambling in growth than the true form of the species. The foliage of this variety in a perfectly healthy specimen is of almost a silvery glaucous hue, and much more desirable than the Common Savin.

Var. *tamariscifolia*, Aiton.—TAMARISK-LEAVED SAVIN.—Syn. *J. Sabinoides*, *Griseb.*—This is classed by Gordon as a distinct species. Our plants lead us to support the classification of Aiton, that it is nothing more than a mere form of the Savin Juniper, with longer and only half-opened leaves. Both this variety and the one preceding it, according to Loudon, "were in cultivation in British

gardens before 1548, as they are mentioned in *Turner's Names of Herbs, &c.*, published in that year."

Var. variegata, Loudon.—VARIEGATED-LEAVED SAVIN.—A very distinct and prettily marked variety, equally as hardy as the parent, and valuable for inserting in a group of dwarf evergreens, on rock-work, etc. A portion of the leaves are pure white, intermixed with pale lemon yellow and the usual dark, sombre green of the species. It is not so vigorous in growth as its parent, however.

15. J. squamata, Don.—SCALED JUNIPER.—Syn. *J. dumosa, Wallich, &c.*—Leaves, medium size, or small, oblong, imbricated, smooth, convex externally, adult ones, mostly acute; young leaves, obtuse, with an inflexed point; becoming persistent, scale-like, and ending in a very long mucro when old; green above, and glaucous below. Branches, numerous, large, reclinate, with brownish-purple, scaly bark. Fruit ovate, or nearly elliptical, solitary, numerous, on short, scaly peduncles, light red or dark bluish-purple.

This is one of the most interesting of all the trailing Conifers. The older plants become remarkably beautiful, not only in shape, but in the delicate glaucous tint that pervades every portion of the foliage. It was introduced into England in the year 1824, and into this country soon afterward. It speedily became popular, and is now one of the standard evergreen shrubs in all good collections.

It is a native of the Himalayas at high elevations, and is quite plentiful in Nepal and Bootan, especially on the higher ranges. On the former range of mountains it is found at the elevation of 15,000 feet, although below the perpetual snow region.

In some localities, particularly on the Choor Mountains, this species forms vast and almost impenetrable thickets, and covers the rugged sides of the mountains with its numerous and dense branches.

Sargent gives an excellent engraving of a specimen of

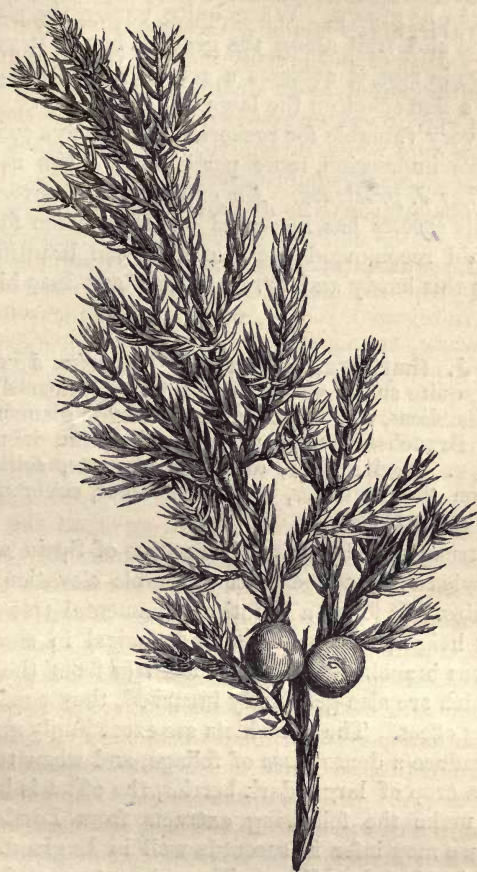


Fig. 36.—JUNIPERUS SQUAMATA.

this plant, now growing at Princeton, N. J., in the collection of R. S. Field, Esq., which shows to what perfection it can be grown. When quite young, the plants are prostrate and trail along the ground, but as it gradually increases in age, it assumes a compact, conical form, and creates a fine effect on the lawn.

It is very valuable for rockeries, and always conveys an agreeable impression, more particularly when used with the darker *J. prostrata*. An experience of several years with this species has increased our admiration for it, and we would recommend every lover of the beautiful to introduce this hardy and lovely little plant into his collection.

16. *J. thurifera*, *Linnaeus*. — SPANISH JUNIPER. — Leaves, quite small, awl-shaped, acute, imbricated in four rows, glandless, very rigid, spreading, light glaucous green color. Branches, numerous, spreading, and incurved at the apex. Fruit, large, ovate, or obovate, solitary, terminal on the branches, very dark color, covered with a fine glaucous bloom.

The true Spanish Juniper is a native of Spain and Portugal, where it is found at considerable elevations on the mountains. It forms a beautiful ornamental tree 30 or 40 feet in height, very compact and conical in shape, with numerous branches that clothe the tree from the ground, and which are also gracefully incurved, thus producing a pleasing effect. The branchlets are exceedingly numerous, and produce a dense mass of foliage, and when to that is added a crop of large, dark berries, the effect is beautiful.

We make the following extracts from Loudon, from which we may infer it succeeds well in England. "Cultivated in 1752, by Miller. There is a tree at Mr. Lambert's seat, at Boyton, which in 1837 was 28 feet high, with a trunk 9 inches in diameter; one at Bagshot Park, 12 years old, which is 12 feet high, and one at Croome, 40 years planted, which is 30 feet high."

Our own experience with this tree, some years since, was so discouraging that we discontinued its cultivation, but we are pleased to learn it is succeeding well with some cultivators on the Hudson River, in New York. Possibly our own plants may not have been correct, although they answered to the descriptions in English works.

17. J. Virginiana, Linnæus.—RED CEDAR.—Leaves, very small, scale-like on the adult branches, but larger, awl-shaped or subulate, and spreading, on the young shoots, very numerous, closely imbricated, and dark green color. Branches, mostly horizontal, with thin, scaling bark. Fruit, small, dark-purple, numerous, and covered with a fine glaucous bloom.

This valuable native species is found from the Gulf of Mexico to our northern boundary along the lakes; it greatly prefers a mild climate, and is, in consequence, much more rare and smaller in size to the northward. At the extreme South, it does not assume its finest appearance, excepting along the coast.

The Red Cedar, in suitable locations, will grow to the height of 30 or 40 feet, and is generally admired for its very dark color and dense habit of growth. In this latter particular, however, as well as in its general outline, perhaps no species is so variable. We have often noticed a natural grove, consisting of at least one hundred trees, in which there are not two specimens exactly alike in every particular. Occasionally they shoot up like tall, dark green columns, and again others form a regular, conical head. More rarely, trees are noticed with drooping branches or a spreading top, not unlike an ancient Cedar of Lebanon. The great diversity presented by this species is useful in landscape gardening, as groups composed of a variety of forms are invariably admired. Upon arriving at old age, the Red Cedar mostly becomes very picturesque in appearance, and even the formal character, that is so peculiar in some varieties, is lost in the change that usually occurs.

The timber furnished by the Red Cedar is exceedingly valuable, being light, fine-grained, compact, and durable. The heart-wood is of a very handsome dark red color, and is susceptible of a fine polish. It is highly odorous throughout, and is used for a great variety of ornamental work,

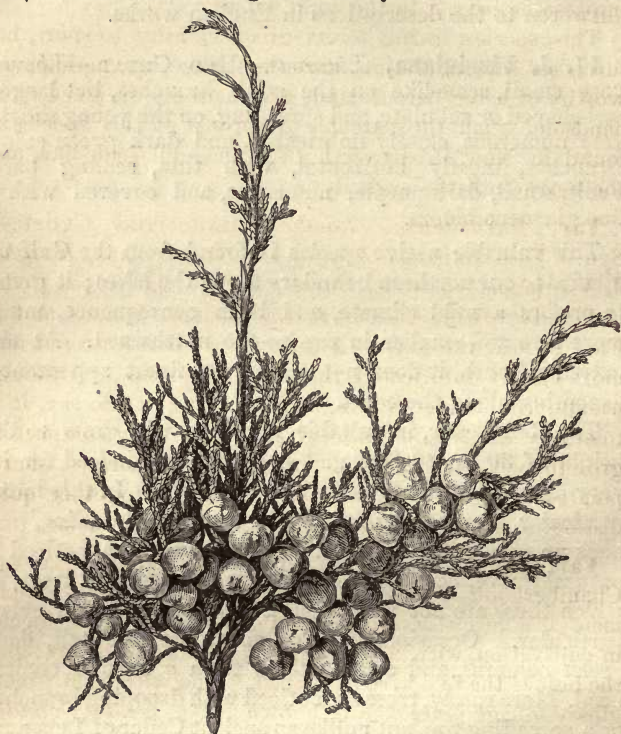


Fig. 37.—*JUNIPERUS VIRGINIANA*, TWO-THIRD SIZE.

as well as for more useful purposes. In the manufacture of lead-pencils it is in great demand, being as well adapted to that purpose as the more rare *J. Bermudiana*.

For hedging, this species is unfortunately badly adapted, the lower limbs always dying out, and the foliage becoming

browed and unhealthy, thus producing an unpleasant impression. For grouping where shelter is required, the trees should not be set too closely together, and thus they may be preserved in all their natural beauty, and form an impassable barrier to the high winds.

This species, owing to its great liability to sport, has furnished several distinct varieties; some are perhaps unworthy of being perpetuated, whilst others are even more handsome than the parent. A variety of this species is found in New Mexico with the leaves all scale-like, and the berries a little larger.

Var. *Barbadensis*, Loudon.—BARBADOES CEDAR.—Syn. *J. Gossainthanea*, *Loddiges*; *J. Bedfordiana*, *Knight*; *J. Virginiana australis*, *Carriere*.—The Barbadoes Cedar is found growing mostly in the Bahama Islands and in Florida, near the coast. The leaves are less scattered, and more closely imbricated than in the species. Although pronounced tender in England, yet, singular to say, it is tolerably hardy and fine with us. It is very compact in growth, with long, slender branches, and narrow, sharp-pointed leaves of a light green color. Altogether quite distinct in appearance from the Common Red Cedar.

Var. *pendula*, Hort.—WEeping RED CEDAR.—Syn. var. *Chamberlaini*, *Hort*, &c.—According to Gordon's supplement, it appears there are three distinct forms of the species in cultivation, with a decidedly drooping tendency; but the best is the one here described. One with light green, glossy foliage is frequently known as *var. pendula viridis*. The variety under consideration has a remarkably drooping habit, with both branches and branchlets as pendent as those of the Babylonian Willow. These long, slender shoots are exceedingly numerous, and present an unique and quite attractive appearance.

Var. *glauca*, Hort.—GLAUCOUS-LEAVED RED CEDAR.—Syn. var. *cinerascens*, *Hort*; var. *argentea*, of *Van Houtte's*

Catalogue.—This differs from the species in its light glaucous color; thus imparting to the tree a silvery appearance, quite in contrast to the usual type. It is as hardy with us as the common form.

Var. variegata alba, and aurea, Hort.—VARIEGATED-LEAVED RED CEDARS.—The first of these varieties is prettily marked with white spots and stripes, and the latter has yellow marblings. Owing to the dark hue of the foliage, these variegations are more conspicuous than usual, and to be recommended to lovers of such sports.

Var. Caroliniana, Loddiges, is thus described by Gordon: "A fine upright variety, with a compact habit, and leaves more or less spreading, acerose or lanceolate, decurrent, scattered, and glaucous on the upper surface. Berries very small, oval, and of a violet color when ripe."

Var. dumosa, Carriere.—Syn. J. Scholli, *Hort.*—Gordon says of this: "A bushy variety of the Red Cedar, with a roundish, spreading, but compact head, largest at the top, and with the leaves either very acute pointed, spreading and straight, or scale-formed, and closely imbricated in four rows." We obtained this a number of years since from a French collection, and if we have the true plant, do not consider it of sufficient interest to recommend it for cultivation.



§3.—CYPRESS-LIKE JUNIPERS.—CUPRESSOIDES.

Leaves, in opposite pairs, four-rowed, small, scale-formed, and closely imbricated in the adult plants. Fruit, more or less angular, and furnished with external bracts, or humps.

18. J. cæsia, Carriere.—GLAUCOUS JUNIPER.—Syn. J. alba, *Knight*; J. fragrans, *Paul*.—"Leaves opposite, with

the primordial ones, and those on the lower parts of young plants, and frequently some of those on the points of the outer shoots, more or less spreading, lanceolate, and very glaucous on the upper surface, while those on the upper and more exposed parts, as well as those on the adult plants, are much shorter, broader, very closely imbricated in four rows, of a glaucous gray, and terminating in a more or less blunt point. Branches and branchlets, alternate, more or less ascending, numerous, very compact, and forming a pyramidal, or somewhat cylindrical head, a little spreading at the top."—*Gordon*.

Carriere says it is found in the north of Europe, growing from 10 to 15 feet in height, and emitting a strong fragrance when bruised. Having received young plants under all the above names from foreign sources, and found them all singularly alike, we were quite ready to consider them the same species, when Gordon so described and arranged them. It has proven to be quite hardy in this country, and is really one of the most handsome and distinct Junipers. We have never seen either the flowers or fruit, and can find no account of them in other works than Gordon's Supplement. It is the *J. dealtata* of Loudon, although totally distinct from the plant of that name described by Douglas. It has also been called *J. occidentalis*, but differs very much from Hooker's species of that name.

We have found it extremely difficult to propagate by cuttings, and on that account it will doubtless be among the rarer shrubs for several years to come. On account of its perfect hardiness, its silvery glaucous foliage, and general beauty of outline, we have no hesitation in advancing the claims of this apparently unknown but deserving Conifer.

19. *J. Chinensis*, *Linnaeus*.—CHINESE JUNIPER.—Syn. Sterile plant, *J. Thunbergii*, *Hooker*; Fertile plant, *J. flagelliformis*, *Reeves*; *J. struthiacea*, *Knight*, &c.—*Sterile plant*, leaves in ternate whorls, dissimilar in shape, but mostly lanceolate, very acute, sessile, rigid, numerous or

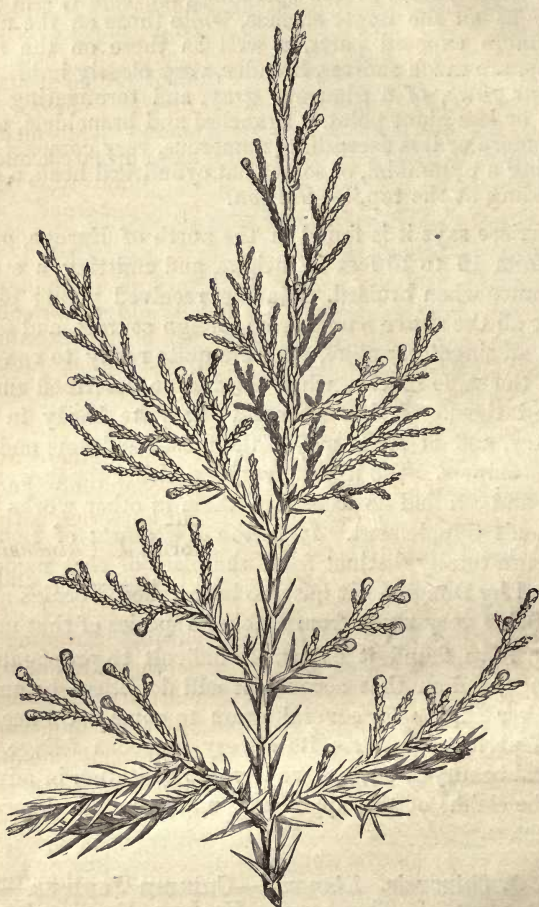


Fig. 38.—*JUNIPERUS CHINENSIS*, FERTILE PLANT.

distantly disposed, spreading or incurved, catkins very numerous, bright yellow color, and covering the plant with their golden hued pollen at maturity. *Fertile plant*, leaves, small, scale-formed, loosely imbricated, and placed binately. Branches, numerous, spreading, drooping, somewhat slender. Fruit small, variable in shape, generally oblong, or spherical, one or two seeded, and of a peculiar dark violet color, with a glaucous bloom.



Fig. 39.—JUNIPERUS CHINENSIS,
STERILE PLANT.

The Chinese Juniper, as commonly known in our nurseries, is the male form, *J. Chinensis mas* of Linnæus, and is a large conical shaped shrub, attaining the height of 15 or 20 feet at maturity. The branches are very numerous, upright, and inclined to spreading, with variously shaped leaves. When in bloom, it is very beautiful; the great profusion of flowers shed their pollen in such large quantities that the shrub

is often completely overspread with the golden-tinted

powder. The female form, or *J. Chinensis foemina* of Linnæus, has numerous, long, spreading, and drooping branches; hence the specific name of Reeves. It is very distinct from the male, not only in color, but in manner of growth and outline.

These large shrubs, or, rather, small trees, are natives of Japan and China, where they are quite common in some districts as well as on some of the neighboring islands. With us the two sexes are about equally hardy, and withstand our coldest winters with impunity; and such has been the experience of others in a more trying climate. Notwithstanding it is well adapted to our country, the Chinese Juniper will never be a popular plant, as its general appearance approaches so very near to that of our Common Red Cedar. Any plant whatsoever that resembles our own native species, is, in the phraseology of our countrymen, "common," and, therefore, to be regarded as of no value. We may be considered unduly prejudiced in favor of our own productions, when we assert that we would vastly prefer having one well-shaped, thrifty Red Cedar than a dozen half-hardy foreigners of doubtful character.

The shape and density of the male form of the Chinese Juniper is greatly improved by clipping the outer ends of all the branches, preserving at the same time a perfect conical form. We have found this clipping process to be advantageous to the whole genus, and more particularly to the spreading species and varieties.

With an experience of twelve or fourteen years with this species, we never could admire it to that degree which some writers have professed. The male form is entirely too stiff and formal in growth to please our ideas of symmetry and gracefulness; moreover, the foliage is apt to lose its vitality on the lower branches. The female form, however, is not liable to these objections, and is a preferable tree. There are so many Conifers more eligible than these

Chinese Junipers, that, were it not for their hardness in all situations, we should part with them without reluctance.

19. *J. occidentalis*, Hooker.—ROCKY MOUNTAIN JUNIPER.—Syn. *J. Californica*, *Carriere*; *J. pyriformis*, *Lindley*; *J. andina*, *Nuttall*; *J. excelsa*, *Pursh & Lewis*.—Leaves either binate or ternate, ovate and obtuse, or needle-shaped and acute, closely appressed, imbricated in three or four rows, resinous, and of a beautiful silvery glaucous green color. Branches, spreading, numerous, with many quadrangular short branchlets, and dark colored bark. Fruit, medium size, roundish, solitary, dark purplish-brown color and glaucous.

This fine rare species is described with an accompanying colored plate in Nuttall's *Sylva*, under the name of *J. andina*; and the author appears in doubt whether it really is distinct from *J. Occidentalis* or not.

Their identity has since been proven, and we have therefore arranged them as above. The tree usually grows about 15 or 20 feet high, although Douglas, who first discovered it, says it is a tree 60 or 80 feet in height; and Jeffrey, as well as Dr. Newberry, puts it at 40 feet.

Nuttall says of it: "On passing a gorge of the Rocky Mountains or Northern Andes, and approaching Lewis' River of the Oregon, we first observed this curious and elegant tree, accompanying groves of the American Cembra Pine, spreading for miles along the declivity of the mountains, and in an opposite direction ascending well towards the summit of a mountain, which still presented patches of snow in the month of July, under the latitude of about 42°."

Its habitat, according to most writers, is on dry, sandy or rocky soil, but it has been occasionally found inhabiting the rich alluvial bottoms along rivers and large streams of water. The great diversity of size in different specimens has also caused dissension among the various discoverers in relation to its true character. Pursh, in describ-

ing it under the erroneous name of *J. excelsa*, remarks, it is a lofty, elegant tree; but Nuttall says: "As a tree it is neither tall nor elegant, but sufficiently singular and interesting." Douglas' plant was remarkable for a hollow gland upon the back of the leaf, containing a clear, odorous resin; but Nuttall states that those he examined "were certainly without any appearance of glands." These conflicting statements are not only liable to mislead botanists, but to cause planters to question whether they have the true plant. Like the *J. cæsia*, this species emits a disagreeable odor when bruised.

The *J. Californica* of Carriere has proven to be synonymous with the *J. Occidentalis*, according to a late edition of Gordon. It was also mistaken by Knight, who gave it the name of *C. bacciformis*. Under the name of *J. Californica* we tested this species, but only for a short time, as it did not prove sufficiently hardy. It is beautifully figured in the Pacific R. R. Reports.

20. J. Phœnicia, Linnæus.—PHÆNICIAN JUNIPER.—Syn. *J. tetragona, Mærch.*—Leaves, ternately disposed, or opposite, ovate, obtuse, closely imbricated, light green color. Branches, numerous, spreading, and covered with reddish-brown bark. Fruit, small, or medium size, irregularly spherical, (containing from 3 to 4 seeds); light, shining yellow color. Flowers diœcious, occasionally monœcious; the two sexes greatly resemble each other in the leaves, and manner of growth.

This Juniper was introduced into England about the year 1683, from the Mediterranean, where it grows principally on rocky soils, and forms a small tree about 15 or 20 feet high. In Sicily, Greece, Levant, Calabria, Barbary, and the south of France, it is quite frequently met with. Being a native of warm climates, it appears to flourish in the Middle States with but indifferent success, and we should therefore recommend a warm exposure and light soil when selecting a suitable place for its culture.

In form it attains to a perfect cone at maturity, with dense branches, that are almost covered with quite small, bright green leaves. Loudon says the berries are about the size of a pea, and pale yellow when ripe, which is not until the end of two entire years. The same author says it is much less common in collections than so fine a shrub deserves to be. The female form of this species, known as *J. Phœnicia fœmina* of Linnæus, has also been described as *J. Langoldiana*, and occasionally as *Cupressus Devoniana*.

Var. *Lycia*, Loudon.—LYCIAN JUNIPER.—This very distinct variety is known under many synonyms, and was considered by Linnæus as a distinct species. It is scarcely as large as the usual form, and more shrubby and spreading in character. The fruit is also very dark, and much larger than that borne by the species. In this country we find it no hardier, but possibly rather more handsome than the Phœnician Juniper. The gum known as *olibanum*, of a bitter, pungent taste and strong odor, and which is used in many of the churches during particular religious ceremonies, is extracted from this tree. Pallas mentions the Lycian Juniper as growing in Siberia as a creeping shrub. It is entirely hardy in England, and very much admired.

21. *J. sphærica*, Lindley.—GLOBULAR-FRUITED JUNIPER.—Syn. *J. Fortunii*, of *Van Houtte's Catalogue*; *J. Chinensis Smithii*, *Loudon*.—Leaves, small, binate, opposite, scale-formed, obtuse, imbricated, spreading at the apex, bright green color. Branches, numerous, spreading, incurved, slender, with many quadrangular small branchlets. Fruit, medium to large, globular, smooth, light violet color.

This very handsome Juniper is unfortunately too tender for our climate,—at least such has been our own experience, and we have not seen it in any other collection. In the most northern portions of China, according to Fortune, it

is quite abundant and forms a large tree, generally reaching the height of 30 or 40 feet.

As it is a native of a cold climate, at least quite as much so as our own, we felt quite sanguine in regard to its success, but our experience has proven the reverse. What effect a warm, sheltered situation may have upon it, we are unable to say at present. It was introduced into the London Horticultural Society's garden about the year 1825 or before, according to Loudon, who bestowed upon it the name of *J. Chinensis Smithii*.

Dr. Lindley says: "This species differs from *J. Chinensis* apparently in not having any acicular leaves, and very decidedly in the size and form of its fruit, which is twice as large as in that species, and not at all depressed at the end, but very regularly spherical."

Var. glauca, Fortune.—Is a very pleasing new variety, that is as yet quite rare, and is considered by some to be a distinct species. It was discovered by Fortune in the north of China, forming a tree 15 or 20 feet high. The foliage is beautifully glaucous, so much so, in fact, as to render it very conspicuous, even at a considerable distance from the tree.

22. J. tetragona, Schlecht, (not of Mæneh.)—TETRAGONAL JUNIPER.—Leaves, small, binate, opposite in four rows, ovate or scale-formed, obtuse, imbricated, dark green color. Branches, spreading, incurved, with numerous, stiff, quadrangular, dense branchlets. Fruit, small, spherical, solitary, dark purple, with a light colored, pretty, bloom.

Another species that has proven too uncertain with us to recommend for general cultivation. As it is entirely hardy in England, we do not wish to discourage its trial by others in this country, and therefore place it in our descriptive list, with a hope that it may eventually succeed in some more favored spot than our own. Our plant was

much exposed, and entirely without artificial protection.

The *J. tetragona* is very abundant on the mountains of Mexico, especially at high elevations, and forms a large spreading bush not exceeding 4 or 5 feet in height. It is exceedingly beautiful and well worthy of trial. The branches are numerous and spreading, with the ends incurved, densely covered with leaves and very numerous, stiff, spreading branchlets. This species must not be confounded with *J. Phœnicia*, of Linnæus, which latter plant is known by some writers on the Coniferæ as *J. tetragona*, of Mæneh.

ADDITIONAL LIST OF JUNIPERUS.

23. *J. Cedro*, Broussonet.—Syn. *J. Cedrus* and *J. Webbii*, *Carriere*; *J. Canariensis*, *Knight*.—This charming Juniper forms a small tree about 10 feet in height, with horizontal or drooping branches, and numerous, rigid, straight, mucronate leaves, of a bright glaucous color. It is a native of the Canary Islands, but will not grow here with any chance of success.

24. *J. Cerrosianus*, Kellogg.—CERROS ISLAND JUNIPER.—Is a new species, recently brought to notice by Dr. Kellogg, who published a description of it in the Proceedings of the California Acad. of Nat. Sci. The leaves are minute, ovate-acute, appressed, imbricated in 6 rows, with an oblong gland on the back. Berries somewhat oblong-ovoid, of 6 to 8 oblong, sub-peltate, mucronate scales, cohering into a 3-seeded berry. Mature fruit sub-3-angled, more or less tubercled, with oblong ridges, or longitudinal ribs, and clothed with a dense blue bloom. Tree of slow

growth, 1 to 2 feet in diameter, and 10 to 15 feet in height. Branches dense, horizontal and spreading. Wood heavy, fine-grained; in texture and color resembling the apple tree, although far superior. It takes a beautiful polish. Dr. Veitch also found specimens in the vicinity of New Idria.

25. *J. taxifolia*, Hooker.—Is but newly introduced into England from Japan, where it flourishes on the mountains with great luxuriance. It is a spreading shrub with drooping branchlets, and rich dark green foliage. Gordon suggests that it is but a variety of *J. rigida*, of Siebold. It may possibly succeed here.

26. *J. Bermudiana*, Linnæus.—Syn. *J. Barbadosis*, L.; *J. oppositifolia*, Mærch. This is the celebrated *Pencil Cedar* of Bermuda, and although very beautiful and desirable, it is entirely too tender for the climate of the Middle States. We have grown it in pots for a number of years, and by plunging it in the open ground during summer, a fine effect is produced. It is dioecious, and the sexes produce their leaves in a different manner, although resembling each other in growth and color. It is conical in form, compact in growth, and of a peculiar yellowish-green color. It grows to the height of 50 feet in its native locality, where it is celebrated and valuable as furnishing the great pencil-wood of trade.

27. *J. flaccida*, Schlecht.—Syn. *J. gracilis*, Endlicher. —A Mexican species growing at very high elevations on the mountains of Real del Monte, etc. It is a small sized tree, but remarkably symmetrical and graceful. The branches are slender and drooping, with small, lanceolate, bright green leaves. We especially recommend this plant for pot-culture, having found it particularly charming when thus grown.

28. *J. Japonica*, *Carriere*.—Syn. *J. procumbens*, *Siebold*.—Is a Japanese species of small size, found on the mountains, where it is quite plentiful, and very attractive on account of its numerous, twisted branches that are clothed densely with small, ovate, rigid, glaucous-green leaves. It is very dwarf, scarcely reaching to the height of 2 feet, and often trailing along the ground. Endlicher considers it a variety of *J. Chinensis*, and describes it under the name of *J. Chinensis procumbens*. In England it is entirely hardy, and we trust it may prove so here.

29. *J. Mexicana*, *Schlecht*.—This we also consider one of our finest pot-plants. We have grown specimens to the height of 5 or 6 feet, with a perfect conical shape, and clothed densely with its peculiar leaves, thus forming a desirable and attractive object on a lawn. It is a native of the mountains of Mexico, at elevations varying from 8,000 to 10,000 feet, and forming compact, conical shrubs, 10 or 15 feet in height. This Juniper is entirely hardy in England, but will not succeed with us.

30. *J. procera*, *Hochst*.—ABYSSINIAN JUNIPER.—Is found in Abyssinia, where it forms a very large tree; but according to Gordon, resembling the *J. excelsa* in other respects, and probably either synonymous with it, or a variety of larger size.

31. *J. gigantea*, *Rœzl*.—Is a new species lately introduced from Mexico. We are afraid it will not prove hardy here, although it was found at elevations of 7,000 and 8,000 feet. In the discoverer's description he states that plants of this species were seen that had attained the height of from 80 to 100 feet.

There are a number of other plants, or rather *names* of *plants*, found in nurserymen's catalogues, that can in almost every instance be traced to some of those heretofore

described. Among the few kinds of which we have no information is the *J. tripartita*, a low bush with numerous ascending and spreading branches, covered with dense glaucous-green leaves. It has proven entirely hardy and very beautiful.

Among the uncertain species of which little is known at present, Gordon mentions the following: *J. Oliverii*, Carriere, from Asia Minor, growing on the Caramanian Mountains, which resembles *J. excelsa*, and probably is not specifically distinct. Willdenow's new species, *J. glauca*, is probably the same as *Cupressus glauca*; and *J. racemosa*, of Risso, is perhaps nothing more than an old variety or species. This latter is from the south of Europe. Every year tends to clear up the mystery surrounding such kinds as the above, so that in a future edition of this work we may be able to throw more light on many uncertain and unknown plants mentioned herein.

13.—WIDDRINGTONIA, *Endlicher*.

Small, Cypress-like plants from Africa. Flowers, dioecious; cones, globular, consisting of four oval, mucronate scales, and containing from 5 to 10 ovules, adherent to the base of each scale. The genus was named in compliment to Captain Widdrington. The species, so far as known, is tender, even in England.

1. *W. Commersonii*, *Endlicher*.—Is a new and unintro-duced species from Madagascar but of which the character is little known.

2. *W. cupressoides*, *Endlicher*.—Has several synonyms given it by different authors. It is a tender little plant from the Cape of Good Hope, where it forms an erect, conical shrub.

3. *W. juniperoides*, Endlicher.—A medium-sized species from the Cape of Good Horn, growing on the mountains.

4. *W. Natalensis*, Endlicher.—Is a new species (?) of which little is known; but as it comes from the southern portion of Africa, it is undoubtedly tender.

5. *W. Wallichiana*, Endlicher.—Another species from the Cape of Good Hope, where it was first seen by Dr. Wallich, forming a medium-sized tree.



14.—CALLITRIS, Ventenat.

Flowers monœcious, terminal; cones, roundish, consisting of four truncated scales, and with one or two ovules at the base of each. The name is derived from the pretty appearance of the jointed shoots.

C. quadrivalvis, Ventenat.—Is either a large tree or shrub, owing to the situation, and comes from the north of Africa. Gordon states it is hardy in the milder parts of England, and in our southern climate it may also prove satisfactory. We imported it under the name of *Thuja articulata*, of Wahlenberg, and have grown it as a pot-plant for several years, to our great pleasure. It is the only species.



15.—LIBOCEDRUS, Endlicher.

Flowers, monœcious and terminal; male aments rather oblong, inclining to spherical; female aments spherical and solitary. Cones rather small, ovate, with from 4 to 6

woody, coriaceous, concave scales, terminating in a small, incurved spine. Seeds mostly 2 under each scale, winged. Cotyledons, 2. Leaves imbricated in four rows, appressed and scale-formed.

A genus composed of large-sized trees, found in South America and the islands bordering on the coast, as well as on our Pacific coast.

Gordon says the name is "derived from *Libanos*, incense; and *Cedrus*, the Cedar."

1. *L. Chilensis*, Endlicher.—CHILIAN ARBOR VITÆ.—Syn. *Thuja Chilensis*, *Lambert & Don*.—Leaves ovate-oblong, obtuse, somewhat trigonous, adpressed, and beautiful glaucous green in color. Branches numerous, pendulous, with light gray bark, and jointed, compressed, spreading branchlets. Cones, small, oblong, terminal, 4-valved, drooping, and compressed; scales elliptic, obtuse. Seeds, winged at the apex, decurrent at the base.

A handsome tree from the Andes of Chili, where it grows to the height of from 60 to 80 feet. Nee and Pavon first discovered it growing in the colder situations among the mountains, where it was afterwards observed by Pæppeg.

Having tested this species in several favorable situations, we unhesitatingly pronounce it of no value to northern planters, and this is the experience of others in different localities in the Eastern and Middle States. It not unfrequently survives two or three winters, but in an unsatisfactory manner, merely lingering along until a sudden cold spell of weather abruptly finishes it. In the more Southern States it proves very reliable, and is unquestionably of great value for ornamental purposes.

It forms a beautiful spreading tree, with numerous drooping branches, covered with a gray bark, and clothed with charming, glaucous green foliage, thus contrasting in a pleasing manner with the surrounding vegetation.

Gordon mentions a variety with bright green leaves,

entirely destitute of the peculiar glaucous appearance which is the most attractive feature of the species.

2. *L. decurrens*, Torrey.—Syn. *Thuja Craigiana*, Jeffrey; *T. gigantea*, Gordon; *T. Lobbii*, Hort.—Leaves very small, adpressed, awl-shaped or scale-formed, sharply acute, decurrent, not acerose, bright glossy-green color. Branches, spreading, incurved at the extremities, with numerous, compressed branchlets. Cones, ovate-oblong, pendulous (Bigelow); scales enlarged below the apex, with recurved, tubercle-like spines, the upper ones much the largest. Seeds, two-winged, unequal in size.

This is not a synonym of *Thuja gigantea*, as Gordon and other European authors claim; but a very distinct tree belonging to a separate genus. Douglas was greatly in error when he made the assertion that it was found near Nootka Sound. Seeds of *Thuja Craigiana*, collected by Jeffrey, and grown near Philadelphia, have produced young plants identical with the *L. decurrens*. Dr. Torrey, in the Smithsonian Contributions, states that it inhabits the upper waters of the Sacramento, particularly from lat. 38°

40', to about 41° N. lat., where it was also found (without fruit) by the botanists of the U. S. Exploring Expedition, and by Dr. G. H. Hulse. A noble tree, some-

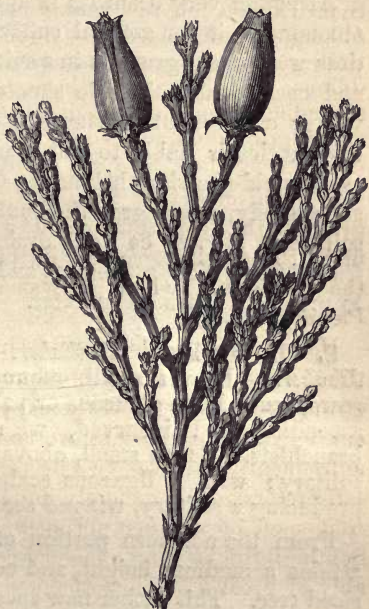


Fig. 40.—LIBOCEDRUS DECURRENS.

times attaining a height of 120 or even 140 feet; and a trunk of 7 feet in diameter is not uncommon. It rises from 80 to 100 feet without a limb. "This tree much resembles *Callitris quadrivalvis* in its foliage. It has probably been confounded with *Thuja gigantea*, of Nuttall, from which, however, it can be distinguished by the foliage alone; the long, decurrent bases of the leaves being characteristics of the *Libocedrus*." Dr. Bigelow says: "This tree is only to be found at an elevation of some four or five thousand feet above the level of the sea, in the Sierra Nevada Mountains of California."

Although very beautiful in appearance, we are afraid to recommend it for general cultivation, notwithstanding it does well on our grounds in a suitable border. The leader, and occasionally the side shoots, are injured during the winter on account of the late succulent growths which this species is liable to make, and which is the bane of these rapid-growing, half-hardy Conifers. To cultivate it successfully, a slow growth should be encouraged, and the soil must always be well drained. Our own specimen fruited freely the past season, and we were thereby enabled to prove its distinct character.

3. *L. Doniana*, Endlicher. — Syn. *Thuja Doniana*, *Hooker*. — Leaves small, adpressed, imbricated in four rows, acute, light glaucous or pale green color. Branches ascending and incurved, with numerous, compressed branchlets. Cones small, obovate or ovate, terminal, and solitary; with 4 ligneous scales in opposite pairs, each producing a solitary, winged seed.

From the northern portion of New Zealand, where it attains a medium height, and occasionally forms a large-sized tree. This rather new species greatly resembles our *Arbor Vitæ*; but, being of recent introduction, we cannot speak of its hardiness in this country, especially in the Northern States. At the South, we judge it could be acclimated, but with us its hardiness is questionable. In

England it is reported as being only "tolerably hardy" in favorable situations, which is equivalent to being tender with us. The timber is of a bright red color, resinous, and hard.

4. *L. tetragona*, *Endlicher*.—Syn. *Thuja tetragona*, *Hooker*.—Leaves very small and numerous, ovate, obtuse, adpressed, imbricated in 4 rows, and of a pale green color. Branches and branchlets, spreading, somewhat drooping, and the latter quite tetragonal. Cones small, ovate, terminal; with coriaceous scales placed in three pairs, each terminating in an incurved spine.

Another new species, just introduced and as yet untested. It comes from the colder regions of the Andes, in Chili and Patagonia, where it inhabits the damp soils just below the snow-line. Lobb found whole forests of this tree close to the snow-line on the Cordillera. It varies in height from a low, straggling bush, to an immense tree 100 feet high, according to the situation where it is found.

The timber furnished by this species is said to be of excellent quality. Although unacquainted with its hardiness, we take pleasure in bringing it to the notice of our planters for trial, as the localities where it is found are in many instances very cold and unpropitious for the growth of tender plants, and it may prove successful with us.

The Gardener's Chronicle says: "This beautiful tree reaches 120, and often more, feet in height; is very luxuriant in its foliage, with thick branches, open and ascendant; is found in great abundance in the provinces of the South, on the hills verging from Valdiva to Chiloe; grows very straight, of great height, and of such circumference that 5, 6, or even 7 men are required to measure round it. It is of the most durable quality, having been worked for ages, and stands the greatest test of the atmosphere; trunks of this tree having been met with buried since the year of the great rising of the Indians in 1599, and these trunks

have been worked up as easily as newly cut timber, only being much heavier."

* * "It proves to be a most useful ornamental plant in consequence of its perfectly erect, close-growing habit, the young plants being quite pyramidal; and it must certainly supplant in time such 'fastigate' monsters as Irish Yews and Swedish Junipers, to say nothing of the singularly beautiful green of its foliage."

16.—**ACTINOSTROBUS**, *Miguel*.

A small and tender genus, composed of a solitary species. Flowers, monœcious, terminal, and globular; cones nearly globular, and consisting of six convex scales, with two ovules under each. Name derived from the radiated scales.

A. pyramidalis, *Miguel*.—SWAN RIVER CYPRESS.—Is a small, conical bush from New Holland, with minute, scale-formed, deep green leaves.

17.—**FRENELA**, *Mirbel*.

Flowers, monœcious. Cones, globular. Leaves, small and scale-formed. This genus of New Holland plants was named in honor of M. Frenel, a French botanist. There are 19 species recognized at present, all exceedingly tender.

1. **F. arenosa**, *Endlicher*.—A small bush.

2. **F. australis**, *Mirbel*.—Is 60 or 70 feet in height.

3. **F. calcarata**, *Cunningham*.—A tree but little known.
4. **F. ericoides**, *Endlicher*.—A small shrub.
5. **F. Fothergilli**, *Endlicher*.—Forms a small tree.
6. **F. fruticosa**, *Endlicher*.—A small tree.
7. **F. glauca**, *Mirbel*.—A small bush.
8. **F. Gunii**, *Endlicher*.—A large tree.
9. **F. Hugelii**, *Carriere*.—A large, conical tree, with ascending branches.
10. **F. macrostachya**, *Knight*.—A small, straggling bush, more hardy than the other species.
11. **F. propinqua**, *Cunningham*.—A conical bush, of which but little is known.
12. **F. pyramidalis**, *Carriere*.—Is a large bush or rather small tree.
13. **F. rhomboidea**, *Endlicher*.—A large, Cypress-like bush.
14. **F. rigida**, *Endlicher*.—A small bush, of which little is known.
15. **F. robusta**, *Cunningham*.—A large, conical tree.
16. **F. Roei**, *Endlicher*.—A shrub.
17. **F. triquetra**, *Spach*.—A large shrub or small tree, with many synonyms.
18. **F. tuberculata**, *Mirbel*.—A bush of which but little is known.

19. *F. verrucosa*, *Cunningham*.—Is a compact, conical-shaped tree.

Læchhardtia, *Archer* (?).—Has been very recently formed by separating the plant formerly known as *Frenela variabilis*, *Carriere*, from the latter genus, from which it is distinct on account of its cones being composed of eight valvate scales in the place of six, as is found in the *Frenelas*. The only species known, is

L. Macleayana, *Archer* (?), which forms a large tree, 60 or 70 feet in height, and is from New South Wales.



18.—*FITZROYA*, *Hooker*.

Flowers supposed to be monœcious; cones, small, terminal, and solitary; with nine recurved scales, arranged in whorls of 3; leaves, flat, sessile, whorled and mostly obtuse; seeds, surrounded by a broad wing, generally in threes, under each scale.

A new and rare genus of recent introduction, which was discovered by Captain Fitz Roy on the mountains of Patagonia and named in his honor by Dr. Hooker.

F. Patagonica, *Hooker*.—This beautiful Conifer will no doubt prove hardy in our Southern States. It forms a large-sized tree, varying in height with the elevation at which it is found. Near the cold summits of the Patagonian Mountains, it is nothing but a mere stunted shrub; but as it approaches the base, it increases in size until it forms a tree of 100 feet in height. Gordon states it is unsatisfactory in England, although standing ordinary winters in favorable situations. It is, however, found "on the borders of perpetual congelation."

19.—THUJA, *Tournefort*.—WESTERN, OR AMERICAN
ARBOR VITÆ.

Flowers monœcious and terminal, on different branches; sterile aments, elliptical or ovoid; fertile aments, ovoid and solitary. Cones small, ovoid, with from 4 to 6 coriaceous scales, the latter spreading, adherent at the base, and covering 2 seeds, winged all round the margins. Cotyledons, 2. Leaves small, scale-like, or awl-shaped, opposite, appressed, and imbricated in 4 rows on the flat branchlets.

The American Arbor Vitæ in ornamental plantations bear a conspicuous part; for not only do they form desirable specimen trees, but are useful in forming screens and hedges. They bear the knife or shears with perfect impunity, the plants thickening up to a degree of density rarely surpassed by any other evergreen. And then again, the comparative cheapness of the type of the genus and the readiness with which it will grow and flourish in almost any soil are additional incentives to its increased cultivation.

The timber is reputed to be very durable. Name probably derived from *thyon*, "sacrifice;" or from the ancient Greek name of some resin-bearing tree. The origin of the common name Arbor Vitæ is involved in obscurity; some writers say it was introduced into England under that title, but the reason for it is unknown.

1. T. gigantea, *Nuttall*.—GIGANTIC ARBOR VITÆ.—Leaves acute, incurved, ovate, quadrately and closely imbricated, entirely destitute of the glandular tubercle, bright green or occasionally glaucous-green in color, and exceedingly beautiful, resembling the fronds of a fern. Branches and branchlets, erect, somewhat flattened, regular in arrangement, long, and slender. Cones abruptly recurved, more clustered and drooping than in *T. occidentalis*, otherwise very similar. Seeds elliptic and furnished with a wide winged margin.

Nuttall says of this species: "This is one of the most majestic trees west of the Rocky Mountains, attaining the height of 60 to 170 feet, or even 200 feet, and being 20 to 40 feet in the circumference of the trunk. On the shores of the Pacific, where this species is frequent, it nowhere attains the enormous dimensions attributed to it in the fertile valleys of the Rocky Mountains, towards the sources of the Oregon. We seldom saw it along the coast more than 70 to 100 feet in height, still, however, much larger than the common species (*T. occidentalis*.)"

The true species is rare in cultivation, owing to the carelessness of some collectors, who have substituted the *Libocedrus decurrens* for it, and whose blunders have been acquiesced in by writers who have not made themselves properly acquainted with the characteristics of the two species. Gordon in his "Pinetum," and Carriere in his "Traite General des Coniferes," prove conclusively by their descriptions that they are totally unacquainted with the true species.

One of the most reliable characters to be governed by in distinguishing the *Thuja gigantea* from the *Libocedrus decurrens*, is the absence of glands on the foliage of the former, whilst that of the latter is plainly dotted over with small, silvery specks. Then again, the leaves of the *Libocedrus decurrens* are generally long, awl-shaped, very acute, resembling a sharp prickle, with quite long internodes on the branchlets. The leaves of the *T. gigantea* are short, very closely imbricated and adpressed, scale-like, with short internodes. The seed is perhaps the best distinguishing feature between them, and is in the *Libocedrus*, 2-winged, largest at the apex, and slightly decurrent at the base; whilst that of the *Thuja* is winged all around the margin, as in our common *T. occidentalis*.

Young plants of this species appear to stand our winters with variable success, and we are afraid it will not prove

to be a valuable acquisition to planters in the Middle States at least, if not still further north.

2. **T. occidentalis**, *Linnaeus*.—AMERICAN ARBOR VITÆ. (White Cedar, incorrectly of some.)—Leaves quite small, closely appressed, rhombic-ovate, imbricated in four rows.



Fig. 41.—THUJA OCCIDENTALIS.

Branches very numerous, ramulose, and assurgent, or recurved. Cones small, oblong-ovoid, with dry, spreading, pointless scales. Seeds with a broad wing all round the margin.

This well-known tree is a native of the northern portion of our continent, inhabiting low, moist situations, princi-



Fig. 42.—SIBERIAN ARBOR VITÆ—*THUJA OCCIDENTALIS SIBIRICA*.—
FROM A PHOTOGRAPH OF A SPECIMEN, 14 FEET HIGH, IN THE
AUTHOR'S COLLECTION.

pally among the mountains. It is rarely found further south than Central New York and Pennsylvania. In Canada and along the lakes it is known as the White Cedar, thus confounding this species with the well-known tree of that name, so common in New Jersey and elsewhere—*Cupressus thyoides*.

The American Arbor Vitæ generally grows to the height of from 25 to 50 feet, and forms a handsome, conical tree, with the lower branches resting on the ground. This peculiar and uniform appearance in its outline renders it very conspicuous in a collection, although Downing considered it too formal for extensive use in ornamental landscapes. It is, however, one of the most hardy and desirable species for small places, owing to the ease with which it is cultivated, and to its exceedingly rapid growth.

An objectionable feature is its proneness to form several leaders, which, during heavy storms of wind or snow, are pressed outward, and thereby the symmetry of the tree is often destroyed. To obviate this difficulty, many cultivators trim in all the side branches, thus allowing the main or true leader to become strengthened, and to induce also the branchlets to become more numerous. This treatment is likewise very judicious with the Junipers, especially with the ascending kinds, such as *J. communis* and its varieties. "The only fault of this tree as an evergreen," says Downing, "is the comparatively dingy green hue of its foliage in winter. But to compensate for this, it is remarkably fresh looking in its spring, summer, and autumn tints, comparing well at those seasons even with the bright verdure of deciduous trees." This fault is also a prominent, and to many a disagreeable feature in the whole genus, and is not confined alone to our native species, but is noticeable even more plainly in the Eastern Arbor Vitæ. Upon the approach of spring, however, a few warm days change this "dingy hue" into a charming, fresh, green color.

The timber of this species is light, quite soft, but durable, and notwithstanding boards and planks of large size cannot be obtained from it, it is in considerable demand for building purposes. For fencing material it is exceedingly valuable, and is used extensively for that purpose, Michaux asserting that posts made from it will last from 35 to 40 years, or three or four times as long as any other species. It yields a pungent, aromatic oil, and the whole plant, when bruised or even slightly disturbed, emits a peculiar, and to some pleasant, spicy, fragrance.

Its adaptability as a hedge plant is now fully appreciated, both in Europe and in this country. To form a perfect and impervious screen in a short time, we recommend that the young plants should be set about 12 or 15 inches apart in single rows. The ground should previously to planting be dug deep and mellow, and the surface afterwards kept clean from weeds. As this species is so patient under the knife, it should be frequently well trimmed to produce the proper shape, which may be at the option of the owner, always, however, bearing in mind to shape the top to an acute point, and thus prevent the injurious effects of large bodies of snow. The late Wm. Reid, of Elizabethtown, N. J., one of the earliest and most successful cultivators of evergreen hedges in this country, gave this *Arbor Vitæ* his decided preference over all other ornamental plants, for a quick, cheap, and handsome screen.

Of later years, numerous marked varieties of this species have claimed the attention of cultivators, its proneness to sport causing quite an addition to our names at least. The most conspicuous and useful of these varieties is the

Var. *Sibirica*, Hort.—**SIBERIAN ARBOR-VITÆ.**—The origin of this valuable variety is involved in mystery, and the confusion consequent thereon is perpetuated by cultivators, both in this country and in Europe. The few authors that have noticed it, appear to be perplexed about

it. We have placed it as a variety of *Thuja occidentalis*, in the firm belief that it is nothing more than an accidental variation from the type of the species. This variety has, however, proven to be of great importance to our collections, combining, as it does, excessive hardness, regular conical form, and a peculiar dark-green and remarkably dense foliage. The demand for the Siberian Arbor Vitæ is annually increasing, and where one or two plants were disposed of a few years ago, hundreds are now sold. Hedges formed of it are really splendid, and surpass in beauty those made from the species.

In the recent supplement to Gordon's Pinetum, the author says: "This kind was originally raised, many years ago, by Mr. Weire, a nurseryman at Coventry;" and then, after classing it as a species, under the heading of *T. Tartarica*, Loddiges, and enumerating some fourteen synonyms, says, the "cones are identical with those of the common American Arbor Vitæ." Taking into consideration this acknowledgment, and finding his descriptions of both kinds almost exactly similar in other respects, we are curious to know what are the distinguishing characteristics that form the species in the present case; and we may add that plants closely resembling this kind have been grown from the seed of our native species in this country.

Var. plicata, Loudon.—PLICATE, OR NEE'S ARBOR VITÆ.—Syn. *T. plicata, Don.*—This variety is a native of our Pacific Coast, from the North-western Territories to Mexico, and was discovered by Menzies in the former, and Nee in the latter place. It generally attains the height of from 30 to 50 feet, and is clothed with foliage to the ground. Although we think with Loudon it is only a marked variety of *T. occidentalis*, it is nevertheless very distinct and handsome. The branches are loose, and present a curiously twisted or plaited appearance. Its hardness is unquestioned, and we consider it a very valuable Conifer for ornamental planting.

Var. plicata variegata, Carriere.—This new plant is said to be quite prettily spotted with pale yellow, and is of rather weaker growth than the species. It originated in France.

Var. variegata, Loudon; and **var. argentea, Carriere** the former having the foliage spotted with yellow, and the latter with white, are not very valuable or showy, even to the lovers of this class of plants.

Var. Hoveyi, Hort.—We are very much pleased with this comparatively new plant, and predict it will prove to be popular when better tested. The foliage is of a bright yellowish green, and the plant compact and globular in form. It reminds one of a fine Golden Arbor Vitæ, and is perfectly hardy.

Var. pumila, Booth.—A dwarf, neat bush, very dense, and perfect in form, having innumerable small branchlets, closely packed together. The outline is regularly rounded, and the color is of a charming shade of green.

Var. nana, Hoopes.—This is an accidental seedling that originated in our own grounds a few years since. It is dwarf in growth, and very dissimilar to the above in its habit. We have grown it for several years, and are quite pleased with its appearance in a collection.

Var. globosa, Hort.—This very pretty kind is grown extensively around Philadelphia, but appears to be unknown elsewhere. It is remarkably globular in shape, and very dense and dwarf in growth. It is exceedingly popular wherever known.

Var. pendula, Gordon.—Syn. var. *asplenifolia*, Hort.—A handsome, rapid-growing variety, with the branchlets and foliage in tufts at the extremities of the drooping branches. It originated in Standish's Nursery, Bagshot, England. Our experience with it for several years has been very satisfactory, and we can recommend it.

Var. cristata, Buist.—Somewhat resembles the above in growth, but is more compact in habit, and we think handsomer. It is certainly very attractive in a group.

Var. densa, Gordon.—Syn. *T. Caucasica, Leroy*; *T. compacta, Standish, &c.*—A very handsome variety that we imported some few years since from France, and one that has very small claims for distinction, owing to its similarity to the Siberian Arbor Vitæ. Gordon says of it: "This kind forms a large, compact, pyramidal bush, growing from 20 to 30 feet high, and nearly as dense as the Chinese Arbor Vitæ. It somewhat resembles the *Thuja plicata*, but is of a much brighter green, and less coarse in its branchlets."

Var. Vervaeaneana, Hort.—A recently introduced variegated plant from France, with much more distinct markings than the older kinds. We are much pleased with its appearance, and as it is entirely hardy, judge it will prove popular among the lovers of variegated-leaved plants.

Var. compacta, Parsons.—From Flushing, L. I., and quite dwarf and compact in habit. In general appearance it differs somewhat from the other varieties, and we think it worthy of perpetuation for the evergreen shrubbery.

Var. ericoides, Booth.—Was first sent to this country a few years since from Hamburg, and is an upright, conical shrub, stiff in habit. The heath-like leaves show very little inclination, if any, to assume the usual form of the parent. See figure 42.

Var. "Tom Thumb," Ellwanger and Barry.—Originated in the Mount Hope Nurseries, at Rochester, N. Y., and differs from the above in having a rounded form, quite slender shoots, and occasionally betrays its origin by a chance sprig with fully developed leaves. This plant was lately introduced into England under the same name as the former, thus making confusion between two very similar varieties.

The above two varieties illustrate a curious and interesting feature in the morphology of leaves.

According to *Braun*, all plants have three distinct systems of foliage, which he calls, 1st, *Cataphyllary*, 2nd,



Fig. 43.—*THUJA OCCIDENTALIS*, VAR. *ERICOIDES*.—STATIONARY IN THE CATAPHYLLARY STATE.

Euphyllary, and 3d, *Hypsophyllary*; and represent, 1st, *Infancy*, 2nd, *Youth*, and 3d, *Maturity*. The first system of leaves, which appear soon after the cotyledons or seed-leaves, form a distinct class by themselves, and in

time apparently disappear, and are succeeded by the second system, or what are generally known as the perfect leaves. These are ultimately followed by

modified leaves in the form of bracts, scales, involucres, &c., which constitute the third and last system.

Figure 42 shows a small sprig of the *var. ericoides*, in which all the leaves are heath-like, and quite unlike those of the usual form. In this variety the foliage remains in the cataphyllary state, or for many years in the condition in which it is in the young plant.

The change from the foliage of youth to that of maturity, or from the cataphyllary to the euphyllary state in the *Arbor Vitæ* is shown in the engraving, figure 41, while the



Fig. 44.—*THUJA OCCIDENTALIS*, PASSING FROM THE EUPHYLLARY TO THE HYP SOPHYLLARY STATE.

further change into the hypsophyllary state, or that in which the leaves assume the forms in which we meet them in the parts of the flower, etc., is given in figure 43.

These three forms, however, never entirely disappear in

the plant, but when not manifest are latent or dormant, and have the power of breaking-out, as occasion requires. In the *Ericoides* and Tom Thumb varieties of American Arbor Vitæ, the cataphyllary leaves have obtained a marked preponderance, and occasionally, as has been stated, the Tom Thumb endeavors to advance to the euphyllary state, and occasional shoots bear perfectly developed leaves. In a bed of young seedling Thujas, the first system of leaves will be found to resemble those of the varieties *Ericoides* and Tom Thumb in every particular.



DOUBTFUL SPECIES OF THUJA.

T. dumosa, Gordon.—We find this plant described as a species in Gordon's Supplement, and as the plant is entirely unknown to us, we copy his description: "A spreading little bush, densely clothed with numerous, short, tufted, flat, fan-shaped branches, growing in all directions, and thickly set with short, forked, two-edged branchlets of a glossy light-green above, but much paler below, and furnished in the back-rib with an elevated, transparent gland.

"This kind forms a dense, dwarf, confused bush, seldom growing more than two or three feet high, somewhat resembling in its branchlets the Nootka-Sound Arbor Vitæ, (*T. plicata*,) but of a much lighter color.

"It is said to be found in the Antarctic regions, and is quite hardy."



20.—**THUIOPSIS, Siebold.**

Flowers monœcious, small, terminal, solitary; staminate aments, cylindrical. Fertile aments, globular, with the carpellary scales reflexed, and covering at the base five

compressed ovules. Cones small, with coriaceous, smooth, orbicular, persistent scales. Seeds with an emarginate, membranaceous wing. Leaves persistent, small, scale-like, appressed, and imbricated in four rows.

This handsome new genus is from Japan, where it was first seen and described by Dr. Siebold, who named it from its resemblance to the genus *Thuja*.

1. *T. dolabrata*, Siebold.—Syn. *Thuja dolabrata*, *Thunberg*.—Leaves short, ovate, obtuse, flattened, or slightly convex above, thick, imbricated, dark-green color above, and glaucous beneath. Branches spreading, verticillate, drooping at the extremities; with numerous, compressed, biserial, branchlets. Cones quite small, ovate, with jagged edges, sessile; scales reflexed, and wedge-formed.

The great rarity of this is, as yet, a serious obstacle in the way of an extensive trial. Plants are being slowly introduced into our collections, and we trust soon to be able to record their suitability to our climate. A fine plant of this *Thuiopsis* in the beautiful collection of Alfred Cope, of Germantown, Pa., has succeeded quite satisfactorily for several years in a shaded situation, but how it might grow on an open and exposed spot, we are unable to judge.

It forms a drooping, conical tree, about 40 or 50 feet high, with rather an open head; the branches extending vertically, and drooping at the extremities. The form is even and regular, with foliage of a remarkably rich dark-green color, which is heightened by a peculiar glossiness on the upper surface, and a glaucousness beneath. The great beauty of this tree has caused it to be very popular in China and Japan, where it is grown extensively in pots, and is also used for avenues.

It delights in a shaded and rather moist situation, which should be borne in mind by cultivators when selecting a location here.

This splendid tree is entirely hardy in England, and we

hope that such may be the case with it here. Indeed, when we remember that the Paulownia and Cryptomeria,



Fig. 45.—THUIOPSIS DOLABRATA.

of indisputable hardiness, (in England,) are natives of more southern provinces, we may reasonably indulge in the wish.

Var. variegata, Fortune.—From the gardens about Yeddo, in Japan, where it was seen by Fortune, and sent to England in 1861. The usual green foliage and branchlets are prettily variegated with pale straw color or lemon yellow.

Var. nana, Siebold.—Another of those dwarf plants which the Japanese delight in producing, and cultivate principally in pots, under the name of *Nezu*. The leaves are much smaller than those of the species, and the plant very dwarf in habit.

NEW SPECIES OF THUIOPSIS.

2. T. Standishi, Gordon.—This very handsome new plant was introduced into the Royal Nursery, at Bagshot, England, by Fortune, in 1861, and was found near Yeddo, in Japan.

The general appearance of this tree is not very unlike that of the preceding species, but the foliage is quite distinct, that of the *T. Standishi* being covered beneath with a glaucousness that renders it quite pleasing, but less silvery than that of the *T. dolabrata*. The leaves of the former are also smaller than those of the latter. The habit of the branches is somewhat pendulous. This may prove to be a variety of *T. dolabrata*, but, if so, a very distinct and desirable one.

3. T. lætevirens, Hort.—A beautiful dwarf Conifer, with somewhat the aspect of a true Lycopod. It has lately appeared in Japanese collections, but whether a true species or not, we are unable to state.

21.—**BIOTA**, *Don*.—ORIENTAL OR EASTERN ARBOR VITÆ.

Flowers monœcious, on separate branches; sterile aments, elliptical, or somewhat elongated; fertile aments, spherical. Leaves small, ovate rhomboid, or scale-like, rather obtuse, imbricated in four rows, opposite, appressed, and glandulose. Strobiles elliptic, with thick, ligneous, or coriaceous scales, placed in opposite pairs, and furnished with a recurved, horny point. Seeds, 2 at the base of each scale, larger than in *Thuja*, ovoid, with a bony testa, and wingless.

This genus was separated from *Thuja* by Don, who considered them so widely different as to warrant the change. In this he has received the support of Carriere and others of our modern writers on the Coniferæ.

The *Thujas* are confined exclusively to the Western continent, whilst the *Biotas* are natives alone of the Eastern.

The *Biotas* are medium-sized trees, growing mostly in an upright or fastigiate form, and, as a general rule, less compact than the *Thujas*.

This defect may possibly be owing to the severity of our climate, injuring the young, unripened wood, for foreign writers allude to the compactness of its growth in the highest terms of praise.

The Eastern Arbor Vitæ are natives of China, India, and Japan, and were first introduced into England about the year 1752. The name *Biota* is derived from *bi*, "two," and *otis*, an "ear."

1. *B. orientalis*, *Don*.—CHINESE ARBOR VITÆ.—Leaves small, opposite, appressed, convex, obtuse, bright green color. Branches recurved and erect. Branchlets, numerous, 2-edged, and thickly covered with leaves. Strobiles rather large, roundish or elliptical, with thick, coriaceous scales, opening lengthwise, and disclosing the naked, ovoid, wingless seeds.

The Chinese Arbor Vitæ has now become so well known in this country as to scarcely need a description, but it is so far inferior to our own native *Thuja*, both for specimen planting and for screens, that it must in future remain decidedly in the rear. It was popular in former years for both the above purposes, but it has now fallen into disuse.



Fig. 43.—BIOTA ORIENTALIS.

This species is found throughout China and Japan, where it grows to the height of 20 feet.

The *Biota orientalis* presents to the student of botany an interesting study in the morphology of its fruit, perhaps more so in respect to the great diversity of outward

form than any other Conifer. Each variety of this species is characterized by a peculiar shape, differing not only from the type of its parent, but from all the others; thus causing a multiplicity of specific names in our standard works on the family. A careful investigation of the internal arrangement of the cones should, however, eradicate all idea of distinct species. We have considered this subject to be of sufficient importance to illustrate the cones of several varieties, showing the very distinct appearance presented. This species assumes different forms of foliage, similar to those mentioned under *Thuja occidentalis*. The common form is seen in figure 45, while figure 46 shows the transition from the cataphyllary to the euphyllary condition.

If the species is liable to objection, its numerous varieties are valuable, particularly the

Var. aurea, Hort.—GOLDEN ARBOR VITÆ.—This really desirable little shrub was introduced by Waterer, under the name of *Thuja aurea*. It is apparently more hardy



Fig. 47.—BIOTA ORIENTALIS, CHANGING FROM THE CATAPHYLLARY TO THE EUPHYLLARY STATE.

than its parent, although not sufficiently so for our more northern States. The form is compact and globular, the color a lively yellowish green, and the foliage more delicate in texture than the species. Its maximum height



Fig. 43.—*BIOTA ORIENTALIS*, VAR. *AUREA*.
able soil.

will perhaps not exceed six feet. A specimen in our own collection, (see figure 47), which is probably one of the oldest in the country, is over five feet high, and a perfect model of beauty. An objectionable feature in this plant is its liability to lose the lower branches and foliage, which greatly disfigures its appearance; this especially occurs when planted in unsuit-

Var. Sieboldii, *Endlicher*.—Syn. *B. Japonica*, *Siebold*; *B. orientalis nana*, *Carriere*, &c., &c.—A pretty little dwarf variety, with a round, compact form, and bright green color. We have imported a *B. Japonica* from Belgium which is quite distinct from this plant, having a fastigiate tendency, instead of a globular form. On account of the peculiar branchlets and leaves of this variety, the Japanese have given it the name of "Peacock's Tail."

Var. variegata aurea, *Carriere*.—This very pretty plant originated, we believe, in the collection of M. Dauvesse, at Orleans, France, and was discovered in a bed of

seedlings. In our opinion, it is the most distinct and beautiful of the variegated Conifers. The rich golden yellow is so exquisitely shaded and mellowed down to pure white, and again so prettily tipped with pink, as to cause the most inveterate hater of these oddities to respect it. If, however, as Dr. Siebold asserts, they are but the result of disease, will they not be less hardy and reliable than when in their normal condition? Practice certainly, in many instances, refutes this theory, for we very frequently find the variegated forms even more hardy than the parent in its perfect state. A case in point is this variety, for it has proven itself to be less liable to injury from excessive cold weather or sudden changes than the species. It also stands our hot summers remarkably well. We also find the variegated Yews to be more hardy than their parent.

Var. argentea, Hort.—We consider this variety as unworthy of cultivation, the young shoots and leaves being merely tipped with white, which is scarcely discernible at maturity.

Var. gracilis, Carriere.—Syn. B. Nepalensis, *Endlicher*.—This is readily distinguished from the species by its delicate small foliage and light green color; the former has also slender and graceful branches, and is more dense in character. It is a native of the higher portions of India and Nepal. It appears quite hardy here, and is much admired by our cultivators generally.

Var. pyramidalis, Endlicher.—Syn. var. stricta, *Loudon*, &c.—Although somewhat resembling the var. *Tartarica* in its form, it is nevertheless distinct. It is very fastigiate in growth, and assumes the proportions of a medium-sized tree, closely resembling at a distance the upright form of a Cypress. It is more rapid in growth, and larger in branch and foliage than the species.

Var. flagelliformis, Jacques.—WEEPING ARBOR VITÆ.



Fig. 49.—BIOTA ORIENTALIS, VAR. FLAGELLIFORMIS.

—Syn. *B. pendula*, *Endlicher*; *T. pendula*, *Lambert*; *T. filliformis*, *Loddiges*, &c., &c.—The Weeping Arbor Vitæ is the most graceful and decidedly pendulous of all Conifers that will survive our northern winters. Its origin is obscure. Some authors hold that it is a distinct and undoubted species, and others, (ourselves included,) that it is only a marked variety, raised from the seed of *B. orientalis*. Figured on the preceding page.

A botanical friend, some years ago, for the purpose of testing its true character, raised a quantity of young plants from seed gathered from this tree, and the result was a stock of unmistakable young Chinese Arbor Vitæ. Not in a single instance was there an exception. A subsequent examination of the fruit has confirmed our opinion that this plant is nothing more than a variety, but, we confess, a very distinct and puzzling one.

In a description of the specimen plant at the Turin Botanic Garden, Dr. Hooker says that the intelligent head-gardener informed him of the same circumstance occurring there that we have alluded to above. Wm. Loddiges, of the Hackney Nursery, England, affirms that he picked out this same Weeping Arbor Vitæ from a bed of seedlings, raised from seed of *B. orientalis*. He was under the impression that it might be a hybrid between that species and *Juniperus Virginiana* or *J. Chinensis*. Dr. Hooker mentions that Lambert "*suspects* it to be a native of the parts of Tartary near China."

The branches of this beautiful Arbor Vitæ curve gracefully to the ground, and, unlike the species, have acute leaves. It has proven reasonably hardy with us, and in most places throughout the Eastern and Middle States; those cases to the contrary are very probably in uncongenial soil. It is exceedingly difficult to root from cuttings, but does well grafted or inarched on the species.

Var. hybrida, Hort.—A variety sent out by the French

nurserymen, which has proven to be very hardy and handsome. It greatly resembles the *var. gracilis*, but is possibly more compact in growth.



Fig. 50.—*BIOTA ORIENTALIS*, VAR. *HYBRIDA*.

Var. *monströsa*, Carriere.—This differs from the species in having fewer, but larger and shorter branchlets, curiously contorted, and thick leaves, mostly obtuse, ovate. A new and unintro-duced plant.

Var. *macrocarpa*, Hort.—This fine new *Arbor Vitæ* was introduced by Ellwanger and Barry, of the Mt. Hope Nurseries, Rochester, N. Y., as "*Thuja macrocarpa*, from California;" but since it has fruited in our own collection,

we have assigned it a true position in regard to its generic name. We believe, how-

Var. *elegantissima*, Rollinson.—A



Fig. 51.—*BIOTA ORIENTALIS*, VAR. *MACROCARPA*.

ever, it is a well-marked variety of *B. orientalis*, with a dense habit of growth, stout branches, large foliage, and with fruit exceeding in size that of any other *Biota*. It has proven quite hardy here, a rapid grower, and quite desirable, although possibly not so distinct as we might wish. The figure, 51, is from specimens with cones much under the usual size, the tree the past season having produced an enormous quantity of fruit.

Var. Tartarica.—TARTARIAN ARBOR VITÆ.—Quite distinct in general appearance from the Chinese Arbor Vitæ.



Fig. 52.—BIOTA ORIENTALIS, VAR. TARTARICA.

In the *Revue Horticole*, Carrière, who considers it as a species, has written an interesting article on the distinctions between it and *B. orientalis*, accompanied by cuts of the foliage and fruit. He recommends its introduction for screens, and for taking the place of the Cypress in cemeteries. It much resembles the Cypress in form, and is of the same dark glossy green color. Being very hardy, it is well worthy of a place in American collections.

Var. Meldensis, Hort.—Syn. *B. Meldensis, Lawson*.—Notwithstanding most foreign writers have considered this curious plant a hybrid, and some even supposed it bore a close relationship to the Red Cedar, (*Juniperus Virginiana*,) it has nevertheless proven to be a distinct variety of the *B. orientalis*. The fruit, which perfected the past season, has stamped its true origin; and a study of the foliage plainly shows that it has abnormal leaves, or, in other words, they are in the *cataphyllary* state. The leaves are sharp, needle-shaped, decurrent, glaucous on the young shoots, and light green on the adult branches. Like the young seedlings of the species, the foliage changes to a dingy hue during the winter months. A remarkable feature in this plant is a curious zigzag form in the



Fig. 53.—BIOTA ORIENTALIS, VAR. MELDENSIS.

younger growth, having the appearance, early in the season, of spiral circles, and is very decided in its character. Although it is quite handsome, especially during the early summer months, we cannot recommend it for hardiness, nor freedom from blight in the lower branches—a serious defect in the whole genus.

DOUBTFUL SPECIES OF BIOTA.

2. *B. falcata*, *Hort.*—Syn. *Thuja falcata*, *Lindley*.—Collectors in Japan have recently introduced this plant, which may prove to be but a variety of *B. orientalis*. It is very upright and conical in growth, with elegant foliage and a compact habit, and is frequently used in its native country for ornamental hedges and screens.

3. *B. pygmæa*.—Introduced under the name of *Thuja pygmæa*, but which also may be nothing more than a variety of *B. orientalis*. "Its beautiful dark-green foliage forms a cushion-like tuft, giving it a most distinct and novel appearance, and rendering it one of the prettiest of dwarf Conifers."—*I. G. Veitch*.

22.—CUPRESSUS, *Tournefort*.—CYPRESS.

Flowers monœcious on different branches, in terminal, small catkins. Sterile catkins composed of shield-shaped, scale-like filaments, bearing 2 to 4 anther cells under the lower margin. Fertile catkins globular, of shield-shaped scales in 4 ranks, bearing several erect, bottle-shaped ovules. Cones globular, firmly closed, but opening at maturity; the scales thick and woody, pointed or bossed in the middle; the few or several narrowly winged seeds attached to their contracted base or stalk. Cotyledons, 2 or 3. Strong-scented evergreen trees, with very small and scale-like, closely appressed, imbricated leaves, and exceedingly durable wood.—*Gray*.

Of this large genus we have but three or four species that will endure the climate of the Middle States. They are natives of North America, Southern Europe, and Asia, varying greatly in size, from the smallest shrubs to the majestic Californian trees that are over 100 feet in height.

The Cypresses constitute a remarkably elegant class of trees, with mostly slender, drooping branches, or, in a few instances, rather formal in outline. In England, where the majority are hardy, writers speak of them as rivaling in elegance and delicacy most of the order; and the variety and great diversity of forms presented by the different species cause them to be held in high esteem. With us, to a certain extent, they are rare and unknown; for although we have sufficiently tested such species as *C. torulosa*, *C. funebris*, and *C. sempervirens*, there yet remain a number of beautiful kinds that may eventually prove useful in our collections.

The Cypress has always been the emblem of mourning, and in some countries the trees are used for planting in cemeteries, where their drooping or upright characters eminently fit them for the situation.

"O'er ruined shrines and silent tombs
The weeping Cypress spreads its glooms,
In immortality of woe."

This custom was introduced by the ancient Romans, who not only planted this tree near the last resting-place of their relatives and friends, but, according to tradition, used it for the purpose of expressing their mourning by placing young sprigs against the house, in the manner crape is used at the present day. The practice of planting the Cypress upon graves is yet religiously observed by the Turks, and the tree is consequently held in respect and veneration by them.

The derivation of the name is supposed to be in honor of the intimate friend of the god Apollo, *Cyparissus*, son of *Telephus*, who was transformed by Apollo into the Cypress tree, after he had died of grief, caused by killing the god's stag. Some authors, however, suppose the name to be derived from the Isle of Cypress, where this genus was first found in abundance.

It appears that Spach has separated a portion of this

genus under the name of *Chamæcyparis*; but his course has been followed by very few writers on the Coniferæ. We have carefully examined Spach's description, and compared it with the recognized characteristics that belong to the *Cupressus*, and cannot see that he is justified in making the change.

1. C. Lawsoniana, Murray.—LAWSON'S CYPRESS.—Leaves, lanceolate, changing to ovate at maturity, short, quadrifarious, closely appressed, with glaucous margins, most with a gland on the back. Branches, ascending, and recurved at the extremities, numerous, flexuose. Cones, small, short-peduncled, many-sided, light brown color, with rough, flat, woody scales, (6,) that terminate in a straight point. Seeds, quite large, generally 3 to a scale.

This very beautiful species is from Northern California, growing in the Shasta and Scots' valleys, and attaining to a height of 100 feet. The discoverer, Murray, mentions it as being the handsomest tree seen by him during his expedition. The habit of the tree is exceedingly graceful; the branches at first curving upwards, like those of the common Spruce, and towards the ends hanging down like ostrich feathers, with the leading shoot, when young, drooping after the manner of the Deodar.

The delicate beauty of this tree is such that it will invariably become a favorite wherever known. The charming feathery lightness of the foliage, which is of a bluish-green color, combined with the general character of the whole tree, forms such a striking feature as to render it the admiration of every one. The tree grows rapidly, and the branches are so slender and regular as to impart the appearance of a delicate mass of ferns or rich glaucous-green plumes, curving gracefully to the ground.

When young, it closely resembles *C. Nutkaensis*, but can readily be distinguished from that species by its glaucous appearance, as well as by the more slender and delicate growth. It may not prove so hardy, but it is decid-



Fig. 53.—*CUPRESSUS LAWSONIANA*.—FROM A PHOTOGRAPH OF A SPECIMEN, 14 FEET HIGH, IN THE AUTHOR'S COLLECTION.

edly more graceful and handsome. In England, it has proven a perfect success, and is in great demand; and the ease with which it is grown from seeds is rapidly increasing the stock of plants, and consequently lowering the price.

Our experience with this desirable species has been exceedingly encouraging, and, judging from the few years that it has been known to our cultivators, we can certainly feel very sanguine in regard to its hardiness in the Middle States. When the plants are young, the tips of the shoots are apt to be injured during the winter, which is attributable to their strong and late growth in the autumn, and on this account care must be taken that no stimulating manures be applied.

Probably the finest specimen in the country is in the collection of Parsons & Co., at Flushing, L. I., and is, at the present writing, some 10 or 12 feet high. We have also noticed some excellent plants in the extensive Wodnethe collection.

Gordon says: "The timber is good, clear, and easily worked, with a strong odor."

We know of no species that appears to sport so readily into distinct forms and varieties as the Lawson's Cypress; scarcely a bed of young seedlings can be found that has not several unique looking plants contained in it. A few of the best recognized varieties we here enumerate.

Var. aurea, Waterer.—(GOLDEN VARIEGATED.)—This is a very distinct English sport, originating in Waterer's Nursery, at Bagshot, and said to be quite desirable.

Var. argentea, Lawson.—(SILVER VARIEGATED.)—This differs from the above in having the smaller branchlets and leaves prettily tipped with white. It originated in Lawson's Nursery, at Edinburgh, Scotland.

The Lawsons have also introduced other kinds under the names of

Var. compacta, var. laxa, and var. stricta, but of their merits we are unable to speak. In the grounds of the late Wm. Reid, Elizabethtown, N. J., we noticed two very curious varieties of this species; one quite dwarf and compact in habit, and the other as upright and fastigate in growth as a Pyramidal Cypress.

2. C. Nutkaensis, Lambert.—**NOOTKA-SOUND CYPRESS.**—Syn. *Thuiopsis Borealis, Fischer.*—Leaves, $\frac{1}{8}$ of an inch long, quadrifarious, sharp-pointed, imbricated, appressed, dark-green color, very slightly glaucous, without tubercles. Branches, somewhat spreading, or sub-erect, incurved at the extremities, tetragonal, and very numerous. Cones, small, globular, solitary, with a fine glaucous bloom. Scales, (4,) small, shield-shaped, rough, and terminating in the centre with a thick, obtuse, straight point. Seeds, mostly 3 to scale, flat, with a hard bony testa, and broad, membranaceous wing.

The Nootka-Sound Cypress, (most generally known as the *Thuiopsis Borealis*), is a fine new species from the Pacific Coast, in North-western America. It was found near Nootka Sound, by Menzies; on the Island of Sitka, by Bongard; and at Observatory Inlet, by Dr. Scouler. Gordon says, it is "a tall, evergreen tree, from 80 to 100 feet in height, with spreading or curved flexible branches, which, when old, are covered with small blisters, filled with a fine aromatic balsam; but every part of the plant, when bruised or cut, emits a strong odor, very much resembling the smell of the common Savin."

Our experience with this species has been entirely satisfactory, and we have observed the same success attending it in other localities. Should it continue to be as reliable in the future, we may congratulate ourselves. The tree grows finely, is very compact and dense in habit, is apparently adapted to a great diversity of soils, and has particularly pleasing foliage.

As this plant was unfortunately sent out under the

name of *Thuiopsis*, from which genus, however, it is very distinct, it is yet known by that name in this country, and more particularly in our nursery catalogues. As these misnomers always strike at the very life of botany, every plant should invariably receive its correct title without regard to any previous one that has been incorrectly applied to it. Nuttall says: "It has a near affinity with the common White Cedar, but that has shorter, flatter, and more spreading branches, with tubercles on the back of the leaves, and smaller fruit."

This species was introduced into England in the year 1851, by Dr. Fischer, through the Russian Gardens at St. Petersburg.

3. *C. thyoides*, Linnæus.—WHITE CEDAR.—Syn. *Chamæcyparis sphæroidea*, *Spach*, &c.—Leaves, very small, ovate, appressed, regularly imbricated in four rows, very numerous, light glaucous green color. Branches, spreading, and drooping at the extremities, with numerous 2-edged branchlets. Cones, very small, globular, clustered, short-peduncled, few-seeded; with shield-shaped, blunt-pointed scales. Seeds, very small and globular.

This well-known species has been made the type of a new genus by Spach, and consequently described by several European authors, prominent among whom are Endlicher, Knight, Carriere, Gordon, &c., as *Chamæcyparis*. Our American botanists, however, who have known it from childhood, and whose facilities for close investigation are amply sufficient, refuse to accept the innovation, and consequently retain it in *Cupressus*.

From Florida to our northern lakes, the White Cedar is occasionally found, being more or less plentiful according to the soil and situation. In either of its extreme limits it is somewhat rare, being more abundant throughout the Middle States, Virginia, and North Carolina. It is invariably restricted to low, marshy ground, where it flourishes with unusual vigor, and multiplies with rapid-

ity, soon covering the vast tracts of swampy soil in the maritime districts. It is frequently seen associated with

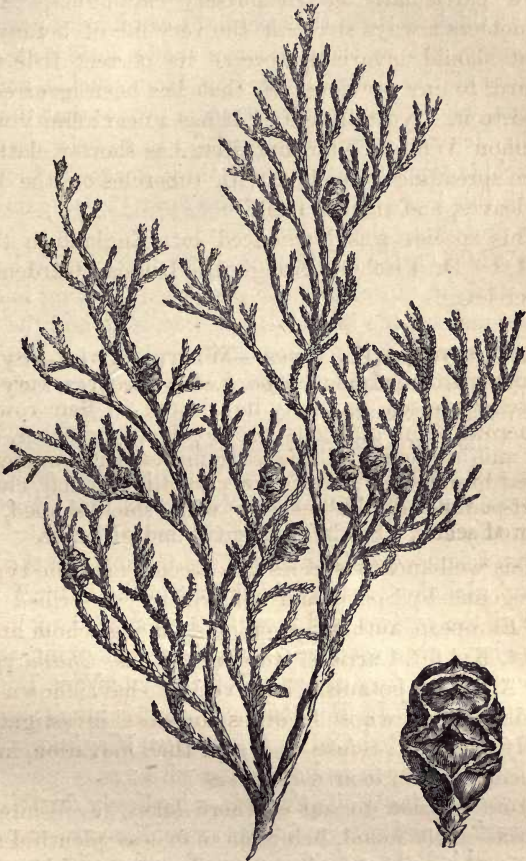


Fig. 55.—CUPRESSUS THYOIDES.

the Deciduous Cypress, (*Taxodium distichum*,) Sour Gum, (*Nyssa multiflora*,) and Red Maple, (*Acer rubrum*,) and forming dense and almost impenetrable masses of foliage,

which, in many instances, constitute delightful localities for the enthusiastic botanist.

In speaking of these swamps, Michaux says: "The trees stand so thick in them that the light can hardly penetrate the foliage, and in their gloomy shade spring at every step tufts of the Dwarf Rose Bay, Honeysuckle, and Andromeda, whose luxuriant vegetation proves that they delight in dark and humid exposures." In addition to these, the orchidaceous plants unfold their gorgeous blossoms beneath this leafy canopy, and the rarer Cryptogamia enjoy its protecting shade.

The White Cedar rarely exceeds 70 or 80 feet in height, with a straight, tapering trunk, and when growing in close, compact masses, the branches are scattered and the head open and straggling. When solitary, however, we have seen specimens of this tree that were far from inelegant. Its general appearance resembles both a Juniper and an Arbor Vitæ; and Emerson remarks in his excellent book on the Trees of Massachusetts, "This graceful and beautiful tree connects the Arbor Vitæ with the Cypressess, having the characters of both; the scale-like, imbricated leaves and fan-shaped branches of the former, and the lofty port and globular or many-sided fruit of the latter."

One of the neatest and most tasteful evergreen hedges that we have ever seen was formed of this plant, and is growing in the fine collection of the late Wm. Reid, at Elizabethtown, N. J. For this purpose it is much superior to our common Red Cedar, (*Juniperus Virginiana*), the latter becoming open and defective with age.

The wood of the White Cedar is exceedingly durable and easily worked, and in regard to its value, Michaux observes: "The wood is light, soft, fine-grained, and easily wrought. When perfectly seasoned, and exposed for some time to the light, it is of a rosy hue. It has a strong aromatic odor, which it preserves as long as it is guarded from humidity. The perfect wood resists the succession of dryness and moisture

longer than that of any other species, and for this quality principally, as well as for its extreme lightness, it is preferred at Baltimore and Philadelphia for shingles, which are cut transversely to the concentric circles, and not parallel like those of the Cypress."

Var. variegata, Loudon.—This is a distinctly marked plant that we have grown for several years with much satisfaction. It is entirely hardy, and forms a striking contrast in a collection. A portion of the branchlets and leaves are marked with white and yellow dots and stripes.

Var. nana, Loudon.—A glaucous and very compact dwarf variety, which is perhaps unknown in this country.

Var. Kewensis, Hort.—Syn. *Chamæcyparis sphæroidea glauca, Endlicher.*—A variety that is said to be very different from the species in many characteristics. The foliage is of a peculiar silvery glaucousness, and the form of the tree is more compact. It grows about the same height as the species.

Var. atrovirens, Lawson.—This differs from the species only in having the leaves almost entirely free from the glaucousness of the parent, and of a bright shining green color.

4. C. fragrans, Kellogg.—FRAGRANT CYPRESS.—Is described in the Proc. of the Cal. Acad. of Nat. Science, Vol. I, page 103, as follows: "This species bears the nearest resemblance to *Cupressus Lawsoniana*, but differs from it most strikingly in the brighter green of its foliage, and its far denser branchlets; also in the leaves being narrower, much more angular, and sharper pointed; the cones are from one-third to twice the size, more rough; also in color, form, and more sparse distribution, etc.; it is also a tree of larger proportions in all respects."

The wood abounds in an oil, which exhales a peculiar spicy aroma; hence it is frequently known among lumber-

men as the "Ginger Pine." It is also called the "*Oregon Cedar*."

In regard to its general appearance, "Mr. A. F. Beardsley, the well-known collector, and enterprising discoverer of this and several other new species, says this tree grows straight, six feet in diameter, 150 feet in height, and nearly destitute of branches for 50 to 70 feet; but when found singly, its long, slender, pendulous branches are retained down nearly to the ground, making the general outlines columnar, surmounted by an elongated pyramid." We presume it will prove equally as hardy as the *C. Lawsoniana*.

TENDER SPECIES OF CUPRESSUS.

The species in the following list have mostly been tested in this country, and are considered by cultivators as rather tender for our climate. A few of the newer introductions may possibly prove hardy. At one time we imported strong plants of every species we could obtain from the European growers, but after a fair test we were obliged to renounce all, excepting those we have previously described.

5. *C. aromatica*, *Van Houtte*.—Syn. *C. Californica*, *Carriere*.—A new and uncertain species of which little is known, and, according to Carriere, a native of California. It is said to be of strong growth, and somewhat like the *C. Lusitanica* in appearance, but no hardier. The foliage and branchlets emit a strong odor when bruised.

6. *C. attenuata*, *Gordon*.—This new introduction is probably unknown in our country, although proven quite

hardy in England, according to Gordon. It is a small tree or large shrub, about 8 or 10 feet in height, and is described as being very graceful and handsome.

It is found in the valleys along streams of water, in the Shasta country of Northern California.

7. *C. Benthami*, Endlicher.—A species from 50 to 60 feet in height, discovered by Hartweg growing on the mountains of Mexico, at elevations varying from 5,000 to 7,000 feet. This fine tree forms a dense, compact head, with long, slender branches. It will not stand our climate. This species must not be confounded with the *C. thurifera*, of Humboldt.

8. *C. Corneyana*, Knight.—Syn. *Juniperus Chinensis Corneyana*, *Gordon* in *Pinetum*.—This very pretty little tree closely resembles the female form of the Chinese Juniper, and was consequently placed as a variety of the same by Gordon, in his *Pinetum*; but the error was afterwards corrected in his supplement. It is a native of China and Japan, where it is known as the Weeping Cypress. This species may prove hardy with us, although we have no evidence of its being tested.

9. *C. excelsa*, Scott.—According to Gordon, this is “a large tree growing 100 feet high on the mountains of Santa Cruz de Kachequil, in Guatemala, producing excellent timber which is very durable.” It makes a beautiful plant for pot-culture, but is entirely too tender for the open air, being easily killed in England.

10. *C. funebris*, Endlicher.—Syn. *C. pendula*, *Staunton*.—This magnificent Cypress, which was introduced into our collections with such sanguine expectations, has entirely disappointed our hopes. It is one of Fortune’s introductions from the north of China, and is the Weeping or Funereal Cypress of their gardens. It changes from an up-

right-growing plant to a graceful weeping tree, attaining at maturity the height of 60 feet.

In Fortune's work on the tea countries of China, he thus speaks of the *C. funebris*: "The most beautiful tree found in this district is a species of Weeping Cypress, which I had never met with in any other part of China, and which was quite new to me. It was during one of my daily rambles that I saw the first specimen. About half a mile distant from where I was, I observed a noble-looking Fir tree about 60 feet in height, having a stem as straight as the Norfolk Island Pine, and weeping branches like the Willow of St. Helena. Its branches grew at first at right angles to the main stem, then described a graceful curve upwards, and bent again at their points. From these main branches, others, long and slender, hung down perpendicularly, and gave the whole tree a weeping and graceful form. It reminded me of some of those large and gorgeous chandeliers sometimes seen in theatres and public halls in Europe."

11. *C. Goveniana*, Gordon.—Another of Hartweg's discoveries in Northern California. He found this species growing on the mountains near Monterey, usually on the western declivities, and near the sea. Although quite hardy in England, our success with it has been poor, but in a warmer climate than our own, it will prove a valuable addition to the evergreen shrubbery. Maximum height 10 feet, with a dense habit.

12. *C. Knightiana*, Perry.—Syn. *C. Lindleyi*, *Klotsch*; *C. Coulteri*, *Forbes*.—One of the largest of the genus, growing in favorable situations 120 feet in height, and, according to Gordon: "A handsome, vigorous tree with a conical head, and all the principal young shoots of a beautiful glaucous-violet, or reddish-plum color." This species has been considered by some writers as a synonym of *C.*

Benthami. Gordon says: "The handsomest and hardiest of the Mexican kinds."

13. *C. Lusitanica*, *Miller*.—THE CEDAR OF GOA.—A tender Cypress, that has been known under some ten or twelve synonyms. It is a very beautiful tree from Spain and Portugal, where it was introduced originally from the East Indies. There is a variety of it in cultivation with prettily variegated leaves.

14. *C. Mac-Nabiana*, *Murray*.—Syn. *C. glandulosa*, *Hooker*, etc.—A large shrub, growing to the height of 10 feet, and found by the collector Jeffrey in Northern California. It is quite hardy in England, and may possibly prove so here. In fact we know of a thrifty young specimen that has survived the past three or four winters. The habit of the plant is very dense, and the foliage glaucous and handsome.

15. *C. macrocarpa*, *Hartweg*.—Syn. *C. Lambertiana*, *Gordon*.—In his Pinetum, Gordon remarks of this species: "It is one of the finest Cypresses yet introduced, on account of its beautiful bright green aspect, its great size, and hardiness. Mr. Hartweg found it forming a tree 60 feet high, with a stem 9 feet in circumference, on the wooded heights near Monterey, in Upper California, and with a far-spreading, branching, flat top, like a full-grown Cedar of Lebanon, which it very much resembles when old. It is hardy, and will grow in almost any kind of soil which is not very poor." We can unhesitatingly add our testimony to its exceeding beauty, but are obliged to say it has not proven hardy with us. Young plants known as *C. macrocarpa* and *C. Lambertiana* are frequently advertised by foreign dealers, but their identity is now fully established.

16. *C. sempervirens*, *Linnaeus*.—UPRIGHT CYPRESS.—This is the beautiful species so common along the Mediterranean, and especially through Italy and Turkey, where it forms an erect, fastigate column of the darkest shade of green, and about 50 feet in height. It reminds one of an evergreen Lombardy Poplar, but will not stand our climate.

Var. *horizontalis*, *Miller*.—This differs from the species in having horizontal branches, and in its spreading character. It is so different in appearance as to lead many cultivators to class it as a distinct species. Both this and the true form have a number of synonyms.

Var. *variegata*, *Knight*, and var. *monstrosa*, *Hort.*, are mentioned by Gordon; the one with variegated leaves, and the other with a Thuja-like aspect and robust habit.

Var. *cerciformis*, *Carriere*.—This curious and remarkable variety was grown at Cognac, France, about 24 years since. It is perhaps the most fastigate Conifer known, as its peculiarity consists in having no side branches, but from the main stem issue the small twigs, which impart to the plant an appearance of a tall, slender green column. It very regularly reproduces the same form from seed. The *Revue Horticole*, in speaking of it, says: "This peculiarity is not, as one might suppose, occasioned by a want of vigor, since some very vigorous specimens 40 feet high are only 2 feet in diameter, everything included, of which size the stem makes one-third, or eight inches."

17. *C. thurifera*, *Humboldt*.—MEXICAN WHITE CEDAR.—Syn. *Chamaecyparis thurifera*, *Endlicher*; *Juniperus thurifera*, *Bonpland*.—A handsome species of large size from the mountains of Mexico, where it is found at high elevations. Its scattered, horizontal branches spread out on every side to a great distance, with foliage of a charming glaucous-green color. The strobiles are larger than

in *C. thyoides*. It belongs among those which were separated by Spach under the name of *Chamæcyparis*.

Gordon, after recognizing it in his *Pinetum* as a distinct species, thus inelegantly and unkindly passes it over in his Supplement: "The kind misnamed *Chamæcyparis thurifera* by one of our great botanical advisers, and so extensively distributed by lottery or otherwise, is identical with the Chinese Arbor Vitæ (*Biota Orientalis*)." Now we are not able to see how a Chinese Arbor Vitæ could possibly be palmed off on an unsuspecting public, especially when the published botanical description of *C. thurifera* is so very different from that of the former plant; and also, Chinese Arbor Vitæ do not grow in Mexico.

18. *C. torulosa*, Don.—Although this is a remarkably handsome species and very desirable, were it sufficiently hardy, it cannot be grown in the Middle States. It comes from India, where specimens have been measured 150 feet in height. The timber is fragrant, durable, and valuable; and the whole tree is especially adapted for ornamental purposes in a suitable climate. In some of the mountainous districts of India, it is held in religious veneration by the natives, and the branchlets and fruit are considered by them as sovereign remedies for all the ills that flesh is heir to. In fact, death is the penalty to all who injure this tree, so great is their belief in its efficacy.

Gordon mentions the following varieties, viz.:

Var. *viridis*, Hort.—With bright, glossy green leaves and slender branches.

Var. *majestica*, Hort.—Of a very robust habit, and more hardy than the species; and

Var. *nana*, Hort.—A curious dwarf and compact little plant.

19. *C. Uhdeana*, *Gordon*.—Another rare and tender species from the mountains of Mexico, where it forms a dense, compact tree about 50 feet in height. It is very beautiful, but only suited for pot-culture with us, although a native of high and exposed situations.

20. *C. Whitleyana*, *Hort*.—Syn. *C. Roylei*, *Carriere*; *C. australis*, *Low*.—This species is also quite tender, and unknown to us in this country. It is a native of the East Indies, where it grows to the height of 100 feet, with numerous, erect branches, and large cones and seeds.

23.—RETINISPORA, *Siebold*.

Flowers, monœcious, small, terminal, and on the same branch. Sterile aments, cylindrical. Fertile aments, solitary, with two ovules at the base of each woody, wedge-shaped, carpellary scale. Strobiles, small, ligneous, globose, with numerous ovate scales. Seeds very resinous, with resinous vesicles on the testa, and a membranaceous wing. Cotyledons, 2. Leaves, small, linear, bifoliate or trifoliate, spreading, and persistent. Very closely allied to *Cupressus*, and possibly not sufficiently distinct for a separate classification.

A beautiful genus recently introduced from Japan. The size of the different species varies from mere shrubs of 3 or 4 feet, to tall trees 100 feet in height. They are all very handsome and desirable, and are held in much esteem by the Japanese for ornamenting the grounds around their residences and temples.

The name derives its origin from the resinous coating of the seeds,—“*retine*,” resin, and “*spore*,” seed.

R. obtusa, *Siebold*.—Syn. *Chamæcyparis obtusa*, *Endlicher*; *Thuja Japonica*, *Hort*.—Leaves, scale-formed, arranged in whorls of four, decussate, obtuse, closely appressed, and very persistent (for several years), bright

green above, and silvery glaucous below. Branches spreading and drooping. Cones, globular, terminal, solitary. Scales, 8 to 10, ligneous, light brown color, smooth, with 2 winged seeds at the base of each.

Without doubt the most beautiful of the family; it is found on the Island of Nippon, in Japan, where it forms a great portion of the forest. It is also largely cultivated,



Fig. 56.—*RETINISPORA OBTUSA*.

not only for ornament, but for the beauty and excellence of its timber. The natives attach a sacred importance to this tree, and in consequence use it for building their temples. It forms a tree from 60 to 80 feet in height, with dense, spreading branches, and the foliage of a brilliant green color. It has stood well in England the past few years, although with a slight protection of mats. In our own collection it has been satisfactory for three seasons, but loses the silvery glaucousness on the under side of the leaves, when planted in the open ground.

Var. ericoides.—Syn. *R. ericoides*, *Zuccarini*; *Wid-
dringtonia ericoides*, *Knight*; *Chamæcyparis ericoides*,
Carriere; *Cupressus ericoides*, and *Juniperus ericoides*,
of some authors and catalogues.—This curious, heath-like
little plant is evidently the primordial form of the above
named species; the two bearing the same relation to each
other, as noticed in the description of *Thuja occidentalis*,
var. *ericoides*, and its parent.

It is the oldest form of the genus yet thoroughly
tested in this country, and is among the very few
evergreen shrubs adapted to the climate of the Middle
States. It is a native of Japan, where it is exten-
sively cultivated for ornament, and very frequently grown
in pots. It seldom attains a greater height than 4 feet,
and is of a dense habit and conical form, with bright green
foliage changing to a reddish hue during the winter
months, and is occasionally slightly injured. The small,
slender branchlets are very numerous, and frequently have
a downward tendency in the adult plants.

We have been exceedingly partial to this little Conifer
for several years. It appears mostly hardy here, but the
dingy red color of the foliage on the approach of cold
weather and the occasional dying out of the under branch-
es are against it. As a partial remedy, we would recom-
mend covering this species during winter with evergreen
branches. Gordon says it is tolerably hardy in England.
He also classes the doubtful little stranger known in our
collections as "*Thuja ericoides*," as a synonym of this
species, from which, however, it is very distinct.



UNTESTED SPECIES OF RETINISPORA.

We have no doubt but a portion of the following list
will eventually succeed here, although we have no means
of ascertaining the fact at present. Several are now test-

ing their hardiness in the open air, on the Hudson and at Flushing, in New York, at Boston, etc., so that we shall soon be made acquainted with their characters in this respect.

Var. aurea, *Fortune*, and **var. argentea**, *Fortune*, are two prettily variegated forms introduced from the Japanese collections in the neighborhood of Yeddo, the former marked with yellow, and the latter with white.

Var. pygmæa, *Gordon*.—Is known in some of the English collections as *Thuja pygmæa*,* *Veitch*. It is very dense and small in all its parts, dark green and glossy, and altogether exceedingly desirable, according to foreign authors. It grows from 1 to 2 feet in height, spreading horizontally in every direction. Introduced into notice by *Fortune*, in 1861.

2. R. squarrosa, *Siebold*.—This species has been classed by *Lawson* with *Cupressus*, and by *Endlicher* with *Chamaecyparis*. It is a small-sized tree, with graceful, drooping branches, and glaucous-green foliage. This pretty little species is from the Island of Kiusiu, and the mountains of Sukejama. It scarcely ever exceeds 5 or 6 feet in height, but is unfortunately too tender for our climate, as it will not succeed in England.

Var. variegata, *Siebold*.—"This variety," says *Gordon*, "differs in having some of its branchlets and leaves of a white color, intermixed with the ordinary green ones in a variegated manner."

3. R. pisifera, *Siebold*.—This is a small, slender tree from the Island of Nippon. The branchlets and branches are exceedingly numerous, and the foliage very dense. The cones are very small, and consist of numerous, small, imbricated scales. We regret to add that its hardiness with us is somewhat doubtful.

There are many provisional varieties in cultivation throughout Japan, founded, however, in many cases, upon slight distinctions.

Var. aurea, Fortune, and var. argentea, Fortune.—Two new varieties recently introduced into England by Fortune, who discovered them in the gardens about Yeddo. They are quite distinct and desirable.

4. *R. leptoclada*, Zuccarini.—Syn. *R. squarrosa leptoclada*, Siebold.—This is a large bush from 3 to 6 feet high, growing on the mountains of Japan, and cultivated frequently in the gardens around Yeddo. It is quite hardy in England, and may possibly prove so in this country. The foliage is of a bright glaucous-green color, and imbricated on numerous small branchlets, forming a dense, compact mass.

5. *R. lycopodioides*, Standish.—A new species (?) but recently brought to notice by Japanese collectors, and represented as remarkably elegant and graceful. The leaves are very attractive in appearance, resembling small, dark green scales, and the branches spreading somewhat like *R. obtusa*. It was found in the gardens at Yeddo, in Japan, by Fortune.



24.—CRYPTOMERIA, Don.

Flowers monœcious. Sterile aments, terminal, clustered and very numerous. Fertile aments, terminal, clustered, or solitary, sessile. Strobiles, spherical, clustered or solitary; with numerous, loose, wedge-shaped scales, and from 3 to 5 seeds at the base of each carpellary scale. Cotyledons, 2, 3, or 4.

This fine plant (for there is but one species) is from China and Japan. The name is derived from "*kruptos*," hidden, and "*meris*," a part. It has soft, white wood, and is especially adapted for cabinet-makers' work.

C. Japonica, Don.—JAPAN CEDAR.—Leaves, from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch in length, sessile, smooth, falcate, quadrangular, sharp-pointed, bright green color. Branches, spreading, mostly horizontal, with numerous branchlets. Cones, $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in diameter, globular, mostly clustered, erect, sessile; with numerous, loose scales. Seeds, generally obovate, with a dry, brittle testa.

This tree belongs to the uncertain class of Conifers so perplexing and unsatisfactory throughout the Middle States. When a tree dies outright from the effect of our severe winters, our regret is allayed by a consciousness that it is useless to plant it. Not so, however, with many of the class of which the *Cryptomeria* is a fair representative. We have frequently seen specimens thrive apparently with perfect success for a few years, when perhaps an unusually strong and imperfectly ripened growth would be overtaken by the frosts of autumn, and the tree consequently be disfigured beyond all redemption. Or probably the leading shoot alone is injured, and the zealous owner after encouraging a new upright branch, congratulates himself that the plant is now acclimated and all danger past; but if the mercury falls to zero after a warm spell of weather, the new shoot follows in the way of its predecessor.

Such disappointments as these are of no rare occurrence, but almost every cultivator has experienced them. Frequently throughout our work have we called attention to the only remedy, of sandy subsoils and an unstimulating surface soil, to grow these plants with any chance of success; and if this oft-repeated caution be disregarded in the cultivation of the Japan Cedar, failure will certainly ensue.

This tree generally grows about 50 or 60 feet in height, but according to Siebold, Fortune, and others, it is



Fig. 57.—CRYPTOMERIA JAPONICA.

frequently found 100 feet high. It is a native of China and Japan, and, contrary to the general principle of the American people with their native trees, this species is ex-

tensively cultivated by the inhabitants of those countries.

In favorable situations at Baltimore and Washington, this species proves a perfect success; and even in the neighborhood of Philadelphia we occasionally find excellent specimens, although many of them present a rather open and straggling appearance. To prevent this unsightly character, we would suggest to planters that no tree is more benefited by a severe clipping of the side branches than this.

In the year 1844, Fortune first introduced it into England, and his account of it in a wild state is exceedingly interesting. The timber is not unlike that of our White Pine, and is held in great esteem by the Japanese, especially for the manufacture of cabinet-ware.

Var. Lobbii, Hort.—Syn. var. *viridis*, Hort.—This distinct form has very pretty, pale green foliage. A specimen in our own collection has appeared more hardy than the species.

Var. pendula, Leroy.—A variety with drooping branchlets, but scarcely distinct from the usual form.

Var. nana, Fortune.—Syn. var. *pygmæa*, Loudon.—Extensively grown by the Chinese; it is a curious stunted, dense dwarf, probably growing about 3 feet high.

Var. araucarioides, Hort.—This variety differs very little from the species, and is probably not worthy of perpetuation.



25.—**TAXODIUM**, *Richard.*

Flowers monœcious, on the same branch. Sterile aments in a long spiked panicle, drooping, with few stamens; filaments scale-like, bearing from 2 to 5 anther-cells, that open lengthwise. Fertile aments oval, or ovoid, clustered, ses-

sile, with 2 ovules at the base of each peltate scale. Cones, globular or globose, with angular, woody, thick, shield-shaped scales. Leaves deciduous and distichous.

The *Taxodium* proper is now restricted to one species, with numerous varieties and forms. Brongniart records a new species found in this country, but its existence is much doubted, owing to the inclination of this tree to assume different forms.

The name is derived from two Greek words signifying *Yew*, and *resembling*. In regard to its early botanical history, Loudon records the following notes: "Parkinson, in 1640, expresses his doubts that this tree was not 'a true cipresse,' and suggests that it must have been called so from the fragrance of the wood. It was, however, classed by Linnæus and all succeeding botanists as a *Cupressus*, until M. Richard, in the '*Annales du Musee*,' tom. XVI. p. 269, constituted it a genus under the name of *Taxodium*, which name was applied from the leaves being disposed in the same manner as those of the Yew. Two years afterwards M. Mirbel and M. Schubert described it as a separate genus under the name of *Schubertia*; but the name of *Taxodium*, having been applied first and accompanied by a scientific description, necessarily takes precedence."

T. distichum, 'Richard.—DECIDUOUS CYPRESS. BALD CYPRESS.—Syn. *Cupressus disticha*, *L.*—Leaves from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch long, linear, acute, distichous, flat, alternate or opposite, occasionally in whorls. Branches, stout, horizontal, slightly incurved at the extremities, with numerous slender branchlets. Cones from $\frac{3}{4}$ to 1 inch in diameter, spherical, closed, hard, and uneven; with shield-shaped, woody, thick scales. Seeds, small, ligneous, with narrow wings. Cotyledons, 2 to 3.

The Deciduous Cypress, although strictly a southern tree, thrives admirably in the climate of the Middle States. Its most northern natural limits are the Cypress



Fig. 53.—*TAXODIUM DISTICHUM*.

Swamps of Maryland, and the extreme southern part of Delaware. Throughout almost every portion of the Southern States this tree is found in the low, miasmatic swamps, and occasionally very plentifully, especially along the borders of the rivers and larger streams. Indeed, in the Gulf States these Cypress Swamps cover thousands of acres, and along the Mississippi River particularly they extend for hundreds of miles. In Florida and Georgia the tree is exceedingly plentiful, and borders the rivers with an almost impenetrable mass of foliage.

In the rich alluvial bottoms this tree often grows to the height of 120 feet, forming an immense base, double the diameter of the body of the tree.

The roots often form large, conical excrescences or knobs, which rise above the surface of the soil, and are always hollow. These are usually known as "Cypress-knees," and are frequently used for bee-hives and other purposes. The cause of these knobs is obscure; no apparent function for which they are adapted has been ascertained, but after the tree has arrived at the height of 20 or 25 feet, these curious appendages commence to appear, and more particularly in marshy ground.

The beautiful foliage of this species, as well as its peculiar conical or almost fastigiate form, justly entitles it to a front rank in the list of ornamental trees; and notwithstanding we occasionally find healthy, vigorous plants growing on high, dry situations, we would prefer a moist soil for its successful cultivation. For particular situations the lofty, spiral top of this Cypress looms up above the surrounding foliage with a very agreeable effect. In the case of old trees they frequently change their form and assume a tabular shape, as is instanced in the Cedar of Lebanon. It was introduced into England prior to the year 1640, where it succeeds very satisfactorily.

The many distinct forms which it so frequently assumes have given rise to quite a multiplicity of names, trees

with lighter colored wood being designated as the *White Cypress*, whilst the darker hued varieties are known as the *Black Cypress*. It is also called the *Southern States Cypress*.

The timber of the *T. distichum* is, without doubt, of inestimable value, being fine-grained, soft, very elastic, strong, and exceedingly durable. This last quality is perhaps unequalled by the timber of any other tree, and it is admirably adapted for use where it will be exposed to the weather. But either from a scarcity of the article or difficulty in obtaining it, the Cypress shingles and other forms of this lumber are now quite scarce, and rarely seen in our Northern markets.

Many of the varieties are mere sports, whilst others perpetuate their distinctions when grown from seed. The most prominent among the latter class is

Var. Mexicanum, Gordon.—It is known by seven or eight different synonyms. Specimens of this variety are growing in Mexico, which are of immense size and great age, especially the celebrated "*Cypress of Montezuma*," at Chapultepec, that measures about 100 feet in circumference. This variety differs from the species in the leaves being very persistent and slender, with the long branches broadly spreading. The strobiles are larger, and the scales armed with a stout, acute point. This tree is entirely too tender for our climate.

Var. fastigiatum, Knight.—This variety forms a remarkably fastigiate tree, with short and erect branches. It is a native of our extreme Southern States, particularly in Florida, where it forms a small-sized specimen.

Var. denudatum, Leroy's Catalogue.—This differs from the species in having long, slender, drooping branches, and with the leaves scattered and of unequal size. It originated in Leroy's Nursery, at Angers, France.

Var. nanum, Carriere.—Another of those chance kinds from one of the French nurseries, and is very small in all its parts, resembling the species in miniature. It grows but 10 or 12 feet in height.

26.—GLYPTOSTROBUS, *Endlicher.*

Flowers, monœcious, the two sexes on separate branches, and resembling *Taxodium*. Cones oval or ovate. Ovules 2, under each carpellary scale. Scales coriaceous, with the pedicels arising from the same point on the axis. Leaves, generally triquetrous, and scattered more or less irregularly around the branches.

Glyptostrobus is one of the newer genera, and one that we are much inclined to receive with distrust, as it is quite too closely allied to *Taxodium*. Time and further investigation will determine its right to the distinction, and as there is considerable difference of opinion on the subject at present, we have accordingly adopted Endlicher's name, although disagreeing with Gordon in the classification of *G. pendulus*.

Endlicher has created the name from the handsome surface of the strobiles, presenting a curious embossed appearance, which is not of so marked a character in the *Taxodium*. It is derived from *glypho*, embossed, and *strobis*, a strobile or cone.

This genus is composed of two species, both natives of China, and equally beautiful.

1. *G. heterophyllus*, Endlicher.—Syn. *Taxodium nuciferum*, *Brongniart*.—T. Japonicum, *Denhardt*, etc. Leaves, from 3 to 8 lines long, very variable in shape and position, from ovate, obtuse, to scale-formed, acute, appressed and imbricated, or spreading and recurved, somewhat bifarious, or scattered around the shoots, alter-

nate, glaucous-green color. Branches ascending, and recurved at the extremities. Cones small, ovate or cylindrical; scales unequal in size, imbricated, shield-form, with a recurved, obtuse point arising from near the edge of each.

We are sorry to be obliged to report this species quite doubtful in regard to hardiness; but even in the less variable climate of England, it is only "tolerably hardy." Like most of the genus it prefers low, moist grounds, and in the wet soils of the rice countries of China, it flourishes in perfection. The natives place it around their plantations, especially in the neighborhood of *Kiang-nan* and *Shang-tun*, where it is known as the *Then-Tsong*, or Water Pine, in allusion to its favorite haunts.

Although but a large shrub of 8 or 10 feet in height, the shape is the same as that of the larger growing kinds, being a perfect cone. The branches have an upright tendency, and are very numerous, stout, and abundantly clothed with leaves.

2. *G. pendulus*, Endlicher.—**WEEPING DECIDUOUS CYPRESS.**—Syn. *Taxodium Sinense*, *Noisette*; *T. distichum pendulum*, and *Sinense*, *Loudon*; *T. Sinense pendulum*, *Forbes*.—Leaves, from 3 to 6 lines long, linear, acute, sessile, compressed when young, but spreading at maturity, light green color. Branches, horizontal, with numerous drooping branchlets. Cones, small, ovate; with shield-shaped scales, having acute points on the summit of each. Seeds winged.

The confusion arising from the many names applied to this species is on account of its close approximation to each of the allied genera, *Glyptostrobus* and *Taxodium*. We believe, however, that as the former genus has been recognized, this plant should claim a position in it. We can confidently pronounce it the most beautiful of all deciduous Conifers, entirely hardy, and unexceptionable in every way.

This species is from the colder portions of China and Japan, where it frequents the damp soils of the low coun-

tries, and forms a perfectly conical-shaped tree from 15 to 20 feet in height. An experience of about 15 years with this Cypress has been so entirely satisfactory that we feel willing to recommend it to every one as an available or-



Fig. 59 —GLYPTOSTROBUS PENDULUS.

namental tree; and notwithstanding Gordon says the young shoots are frequently killed by the cold in England, we are pleased to record their perfect hardiness in the Middle States. In Sargent's edition of Downing's Landscape Gardening, it is mentioned as entirely hardy at Wodenethe, and is mentioned by Sargent as "one of the most graceful and exquisite little trees which will survive the rigor of our northern winters." A splendid specimen

in the Evans collection is of nearly the maximum size, and is a perfect model of excellence.

The Weeping Deciduous Cypress derives its name from the drooping tendency of the branchlets. These are placed alternately on the stout horizontal branches, and are exceedingly numerous and well furnished with foliage. Their gracefulness, added to the charming color of the leaves during the summer, is the attractive feature of the tree. During the autumn months, the verdure changes to a pale yellow hue, and afterward to a bright orange-red.

This species has been considered as a variety of *Taxodium distichum*, but the formation of the leaves is so very distinct as to enable the observer to distinguish them at once. The foliage of the former is always imperfectly two-rowed, and more or less appressed; whilst that of the latter is always two-rowed and spreading.



Fig. 60.

A plant of this species flowered last season at Kew, England, and resembled the *Taxodium distichum*, in having pendulous spikes of male aments, with one or two female cones at the base of the spike. It sheds its ultimate branches annually, but it differs in the foliage not being distichous, in the scales of the cone not being peltate, but arising from one point at the base of the cone, and in the winged seeds. The stem, branches, and foliage, are also very dissimilar, but these are so liable to sport that no dependence can be placed upon them when forming true botanical distinctions. A branch one-third the natural size is shown in figure 59, and figure 60 gives the leaves of the real size.

CHAPTER XII.

THE YEW SUB-FAMILY—**TAXINEÆ.**

Figure 61 gives a branch of the American variety of *Taxus baccata*, with magnified flowers and fruit, to illustrate the leading characters of this sub-family, which are sufficiently described on pages 14 and 73. An enlarged staminate ament is shown at *a*. The pistillate ament, *b*, consists of a naked ovule in a cup-shaped disk, and surrounded by scales; this is better seen in the section, *c*. After fertilization, both the seed and disk increase in size, the latter becoming pulpy, and at maturity concealing the seed; *d* and *e* show the fruit in different stages of growth. The mature fruit is given at *f* entire, and at *g* in section.

27.—TAXUS, Tournefort.—YEW.

Flowers usually diceious and axillary. Sterile aments, small, globular, few-flowered. Anther cells, 3 to 6 or 8, inserted in clusters under the peltate scale. Fertile flowers, scaly-bracted, solitary, with a single naked ovule placed upright in the cup-shaped disk; the latter becoming berry-like, viscous, and pulpy in fruit, almost surrounding the nut-like seed. Leaves usually linear, rigid, decurrent, and mostly distichous. Cotyledons, 2.

The Yew has been known and appreciated for ages, and is yet one of the most esteemed evergreen trees. Although growing very slowly, it possesses a peculiar tint in the color of its foliage, so far unapproached by any other genus of plants; it is especially admired for its



Fig. 61.—*TAXUS BACCATA*, VAR. *CANADENSIS*.

appropriateness in cemeteries, and for producing certain effects in gardening for which its sombreness particularly fits it.

The Yew is preferable to all other Conifers for cemetery planting. There is a peculiar richness in the dark glossy foliage, and a certain stiff formality in the growth that please our taste for this particular purpose. Meehan, in his Hand-book, thus speaks of the Yew: "Opinion is divided in regard to the merits of this tree in ornamental gardening. Some deem that its long association with the English churchyards and cemeteries suggests ideas too funereal for the life-enjoying pleasures of a garden. Others look on the well-known degree of abuse it will submit to as a subject of pleasing reflection, suggestive of the victorious nature of meek, uncomplaining, persevering effort in overcoming all obstacles. But for the once setting aside both poetry and association, our collections are too scarce of evergreens to allow us to dispense with one, and for my part I admire the Yew."

The late A. J. Downing, in his usual pleasing style, speaks of it thus: "For the decoration of places of burial it is well adapted, from the deep and perpetual verdure of its foliage, which, conjointly with its great longevity, may be considered as emblematical of immortality."

The allied genera of *Taxus*, *Torreya*, *Cephalotaxus*, *Podocarpus*, etc., differ but little in the general appearance of the leaves, and are therefore scarcely to be distinguished, excepting when in fruit. The Yews are proverbially long-lived, and instances are given where they have existed for centuries, growing, says Loudon, until they arrive at the age of 100 years, and then remaining stationary.

The Yews are indigenous in the milder climates of Europe, Asia, and the United States. The name is probably derived from the classical title of "*toxon*," a bow, in allusion to the wood of this genus being used for making bows. Other authorities suggest the derivation to be

from "*taxis*," meaning arrangement, owing to the regular system of the leaves, being placed upon the branchlets. And again, the word "*toxicum*," poison, has been given, as the Yew has been considered poisonous by many.

1. *T. adpressa*, Knight.—Syn. *T. baccata adpressa*, *Carriere*; *T. tardiva*, *Lawson*; *Cephalotaxus tardiva adpressa*, *Siebold*, etc.—Leaves, small, oval or elliptical, generally mucronate, decurrent, distichous with short peduncles, excepting on the young shoots, dark shining green color. Branches, numerous, spreading, with numerous, short, slender branchlets. Seed surrounded by a globular or oblong, very glutinous, fleshy, pale pink disk; seed, nut-like, standing erect, quite prominent above the disk.

Our own specimens of this species having fruited for two or three years past, we are able to state positively that it is a well-defined *Taxus*, although many writers on the subject have thought otherwise. *Carriere*, in the *Revue Horticole* a few years since, contended that it was a *Taxus* on account of its apparent affinity to the Yew stock in grafting, but suggested that it was a form of *Taxus baccata*.

It is a native of Japan, and was introduced, we believe, by *Siebold*, who stated that it grows plentifully on the mountains, and scarcely ever exceeds three feet in height. It is certainly one of the most attractive, hardy, and desirable species, and with an experience of many years we can recommend it to all our planters. In form it is somewhat similar to our native Yew, growing mostly with the same spreading habit, and with numerous slender branchlets densely clothed with foliage. The leaves are quite curiously shaped, and differ in this respect from the other species, being more or less oval instead of linear.

This charming shrub has many excellencies to recommend it for groups and masses, as well as for planting singly on the lawn. It is a healthy and luxuriant grower after becoming well established, and gives universal satis-

faction for cemetery planting. In this latter position we consider it far superior to the other species, as it almost invariably retains its dark glossy color without protection, and is of a small and compact form, which enables it to be used for ornamenting small lots where the larger species would be out of place. It is exceedingly difficult to increase by means of cuttings, but will readily unite with the common Yew by grafting.

2. *T. baccata*, *Linnaeus*.—ENGLISH YEW.—Leaves, about 1 inch long, linear, numerous, mostly distichous, straight or slightly falcate, occasionally scattered thickly around the leading shoots, acute, dark glossy green. Branches, numerous and spreading, with slender, drooping branchlets. Fruit consists of a globular, fleshy, red disk, nearly surrounding a nut-like seed.

This well-known species is found growing in most of the countries of Europe, generally on the mountains at different elevations. Its usual height is from 25 to 40 feet, but it often attains a still greater size; in this country it forms a large-sized shrub. Its utility with us may well be questioned, as plants frequently become injured beyond redemption after having survived several winters. In suitable spots they will thrive satisfactorily for several years, although occasionally suffering from the frost, which destroys the imperfectly ripened young wood.

In planting this tree, care should be taken to select a shaded location, such as the north side of a building, or under the protecting branches of other trees; and where it is planted in an exposed situation, we have found great advantage to be derived from covering the plant loosely with evergreen boughs. The object is to protect the plant from the direct rays of the sun; by this means we manage to have all the Yews of as fine a color when spring returns, as they presented during the preceding autumn. Care must in every instance be taken that the covering be

not too tight, or the remedy will prove far worse than the evil itself.

The usual form of the English Yew in this country is a large bush with numerous ascending or slightly spreading branches, clothed with fine, dark-colored foliage. During the rage for clipping trees into grotesque forms, this species was probably used for that purpose in preference to any other; but we sincerely trust that such a perverted taste will never again be introduced into our gardens, to destroy the beautiful outlines that Nature has bestowed upon our trees.

In speaking of the longevity of the English Yew, Nuttall quotes several instances of its great age. He says: "The antiquity of the Yew is as surprising as any other of its properties. Mirbel counted in a slice of Yew, 20 inches in diameter, 280 annual layers, and Mr. Pennant mentions a Yew in Fortingal churchyard, in the Highlands of Scotland, whose ruins measured $56\frac{1}{2}$ feet in circumference, and was in all probability a flourishing tree at the commencement of the Christian Era." According to Loudon, "the largest tree of this kind in England is in Harlington churchyard, near Hounslow, which is 58 feet high, with a trunk of 9 feet, and a head of 50 feet in diameter. The oldest are at Fountain's Abbey, where they are supposed to have been large trees at the time the Abbey was founded, in 1132. The trunk of one of them is 26 feet 6 inches in circumference, at 3 feet from the ground. The Aukerwyke Yew, near Staines, is supposed to be upwards of 1000 years old."

The wood of the Yew is exceedingly heavy, remarkably elastic, durable, and fine-grained; thus combining all the requisites that are sought for in valuable timber. The heart-wood is very beautiful, being of a lively red color, while the sap or outer wood is pure white, and both are readily polished. In durability it cannot be excelled, as instances are known where carvings of this wood are at

least 500 years old, and entirely sound and free from any attacks of insects, or defects. In fact, insects never attack the Yew, either in a growing state or as lumber.

Like our Red Cedar, this species has sported into a number of forms and colors, thus engendering a long list of varieties, which are eagerly propagated and sent out by the European nurserymen; and in many cases, we regret to add, with such a very small amount of distinction as to require close scrutiny to detect the difference. Having tested a large number of these varieties, and found so few of them to be worthy of perpetuation, we feel it our duty to caution our readers against this system of producing novelties at the expense of a too confiding public.

Var. Canadensis, Gray.—AMERICAN YEW.—This is perhaps one of the most distinct and valuable varieties in the list, and was for a long time considered a species, although Loudon placed it as a variety in his "Arboretum." Gordon still adheres to a specific classification, but Prof. Gray, in his Manual of Botany, reduces it to a variety of *T. baccata*. It is also known as the *Taxus procumbens* of Loddiges. The American Yew is called in some sections the Ground Hemlock, and is found on the moist and shaded sides of hills, throughout the northern portions of the United States and Canada. Figured on page 373.

It presents in a wild state a straggling or spreading shrub, rarely exceeding 3 or 4 feet in height; but under cultivation it assumes a more even form, and attains a larger size. It can be pruned into any shape desired, but the most handsome and appropriate is the globular form. This fine dwarf Conifer is very hardy, but changes to a dingy hue during the winter months.

Var. fastigiata, Loudon.—UPRIGHT IRISH YEW.—This is also a very distinct variety, and well worthy of cultivation wherever it succeeds. The branches are all remarkably fastigiate, and the foliage, which is scattered round the

branches, is of the darkest and most sombre hue. The fruit is oblong instead of globular, as in the species. This form of the Irish Yew will generally give satisfaction as far north as Philadelphia, if properly protected during the winter, and we have seen excellent specimens, 8 or 10 feet high, that were growing on the north side of a house without any artificial protection whatever. In England it is quite hardy and remarkably beautiful. Loudon alludes to a fine specimen growing at Comber, in the County of Down, and near the town of Antrim, which was 21 feet high, and which was supposed to have been planted previous to the year 1780. The same author also alludes to two trees, growing at Nether Place, near Mauchline, Ayrshire, the largest of which was 22 feet 6 inches high, and the smaller, 20 feet 8 inches.

A very beautiful form of this variety has variegated foliage and is described as producing a handsome effect. It is known as *var. fastigiata variegata*, of Carriere.

Var. Hibernica, Hort.—SPREADING IRISH YEW.—We received this fine variety a few years ago from John Evans, of Radnor, Pa., who obtained it, if we mistake not, from the Kew Gardens. Not having seen it elsewhere, and being unable to find a description of it, we are curious to know its history. It is, however, a hardy, beautiful, and handsome plant, well worthy of perpetuation. It differs from the fastigiata form in having spreading branches and probably rather smaller and lighter colored leaves; but it is certainly quite distinct from the Common Yew. An excellent characteristic of this variety is that it rarely ever loses its dark, rich color during winter.

Var. Dovastoni, Loudon.—WEEPING YEW.—A form of the Common Yew that is remarkable for its straggling and drooping branches and branchlets. These, when engrafted on an upright stock, present quite an unique and pretty effect, although not sufficiently reliable to recom-

ment for extensive planting. In the form of a low bush, we have grown it for a number of years, and by carefully protecting it during the winter, have succeeded in producing a large plant. This variety is also known under a variety of names, such as *horizontalis*, *imperialis*, *pendula*, *umbraculifera*, &c., &c., all being the same plant.

Var. fructo-lutea, Loudon.—YELLOW-FRUITED YEW.—This only differs from the species in having the pulpy disk surrounding the seed of a bright yellow color, in place of the usual scarlet of the English Yew. Loudon says, “when covered with its berries, it forms a very beautiful object, especially when contrasted with Yew trees covered with berries of the usual coral color.”

Var. erecta, Loudon.—Syn. *T. pyramidalis*, *Knight*; *T. stricta*, *Hort.*—Known as the Fulham Yew, Erect Yew, Upright Yew, &c. It has been quite popular wherever planted, both in this country and England. It is more hardy than the species and more upright in growth, with slender branches that are densely clothed with smaller foliage than that of the common form. Loudon says it was raised from seed of the Irish Yew. In the well-kept grounds of Parsons & Co., at Flushing, L. I., we have observed large beds of this handsome plant.

Var. recurvata, Carriere.—We are not acquainted with this, but it is described in English works as having long, spreading, reflexed branches, and longer leaves than the common Yew.

Var. nana, Knight.—FOX’S DWARF YEW.—Syn. *T. baccata* Foxii, *Hort.*—A very diminutive dwarf variety of the common Yew; spreading in its character, but rarely ever exceeding one or two feet in height. Not yet introduced into this country, to our knowledge.

Var. glauca, Carriere.—GLAUCOUS YEW.—This differs from the species in having the under surface of the leaves slightly glaucous, and the plant more vigorous in growth.

Probably not yet introduced into our American collections. According to Gordon, "this is the largest and finest of all the varieties of the common Yew."

Var. ericoides, Hort.—Is quite similar to the common Yew, but has rather smaller foliage, and a more erect habit of growth. It appears to be about equally hardy with the above in our own garden.

Var. sparsifolia, Loudon.—We received this variety from France a few years since, under the name of *T. baccata monstrosa*. It is also known in some collections as *T. Mitchelli*. The leaves are arranged similarly to those of the upright form of the Irish Yew, but are not of so dark a green as is that variety. The foliage is very widely scattered around the branches, which are straggling and spreading. Altogether it is a curious little plant, but not at all handsome.

Var. variegata alba, Carriere.—SILVER-VARIEGATED YEW.—Syn. *T. baccata argentea, Loudon*; *T. elegantissima, Hort.*—In this variety, the usual green leaves are very elegantly striped, and edged with white.

Var. variegata aurea, Carriere.—GOLDEN-VARIEGATED YEW.—Syn. *T. baccata variegata, Loudon.*—Has the stripes and margins of a pale yellow. In a group of Yews, every one must admire the rich tints and contrasts exhibited in the foliage of these two variegated kinds. The Silver Yew is perhaps the more pleasing of the two, owing to the charming contrast of the pearly whiteness with the usual dark green foliage, but both are highly deserving of a place in every collection. These two forms are very hardy, even more so than the species. We remember observing some beautiful specimens growing on a large rockery springing up apparently out of a rich dark green carpet of the *Juniperus prostrata*, and surrounded by Rhododendrons, etc., where they formed the most attractive objects in the whole collection, and

were unusually appropriate to the situation. One of the best collections of these handsome plants is probably to be found at Wodenethe, on the Hudson, where they are of large size, and very beautifully trained in various ways. A quaint Scotch writer thus characterizes one of them: "*Taxus baccata variegata*, or Golden Yew, when trained to the height of 8 or 10 feet, has no rival for ornamentation, as each leaf is edged with a fine golden yellow color, and the effect of richness and grandeur thus produced is most wonderful." The same writer also fancifully likens it to "a golden candlestick ornamented with glow-worms."

Var. Jacksonii, *W. Paul*.—"A somewhat pendulous kind," says Gordon in his supplement, "with broad, light green foliage, all more or less incurved, falcate, and thickly covering the upper part of the branches, with the branchlets reddish-brown, numerous, short, obliquely placed, and more or less curved." Not yet introduced into this country.

Var. Cheshuntensis, *W. Paul*.—This pretty variety was raised from seed of the Irish Yew, and is conical in form, of rapid growth, and dark glossy-green in color. Recommended by European writers.

Var. linearis has rather narrower leaves, but otherwise is like *var. erecta*.

Var. gracilis is different only in its quite slender branches, and the varieties *empetrifolia*, *nigra*, and *excelsa*, &c., &c., differ but little from the true form of the species, and are, perhaps, not worth growing as distinct forms.



ADDITIONAL LIST OF SPECIES OF TAXUS.

We should judge that several of the following species would be entirely hardy, but as they are mostly new and untested, we place them here.

3. *T. brevifolia*, Nuttall.—Syn. *T. Lindleyana*, Murray. —Is described as growing to the height of from 40 to 60 feet, in North-west America, where it is found in the forests of Oregon, extending far northwards. It differs from the English Yew in having shorter and thinner leaves, which are sharply and abruptly terminated in a point, and attenuated at the base into a very distinct petiole. The sterile aments of this species somewhat resemble those of the *var. Canadensis*, and the quality of the wood is much like that of the *T. baccata*.

Dr. Torrey states: "A small tree in California, but in Oregon it sometimes occurs 60 feet high, with a trunk 2 or 3 feet in diameter. We follow Mr. Nuttall in separating the Yew of the north-west coast from the *T. baccata* of Europe. We have not, however, found the differences pointed out by Mr. Nuttall to be constant."

Dr. Newberry, in his description of this tree, remarks: "The Yew of Oregon and California, where we saw it in the valley of the Willamette, forms an upright tree 50 to 75 feet in height." In a comparison between the *var. Canadensis*, and the one under notice, he adds: "From this comparison it will be seen that the principal differences between the Eastern and Western Yews are found in the upright, arboreal habit, the lighter foliage, and the shorter leaves of the Western plant. This Yew is found on the Sierra Nevada, down nearly or quite to the southern line of California." The same author states that "*T. Lindleyana*, described by Murray, is undoubtedly identical with *T. brevifolia*."

4. *T. cuspidata*, Siebold.—Is a new species recently introduced from Japan into England, and, according to Gordon, has proven "quite hardy" there. It is about 15 or 20 feet in height, with numerous spreading branches, and more or less distichous, incurved, coriaceous, rigid leaves. The leaves are very dark above, and light green below,

with exceedingly sharp points at the apex; hence the specific name. This pretty species is very popular with the Japanese, and will undoubtedly prove so here, should it succeed in our climate.

5. *T. globosa*, Schlechtendahl.—MEXICAN YEW.—This species, described by Hartweg as *T. baccata Mexicana*, has its leaves densely distichous, somewhat falcate, very dark, shining green, and ending in a stiff, sharp point. The branches are produced in much the same manner as those of the English Yew, but with the branchlets more or less drooping. It will scarcely be of interest to American cultivators, as the climate of England is not sufficiently mild for its successful culture.

6. *T. Wallichiana*, Zuccarini.—WALLICH'S YEW.—This is also described as *T. nucifera*, by Royle and others, as well as *T. virgata*, by Dr. Wallich, and *T. baccata Indica*, by Madden. It forms a splendid tree on the mountains of Sikkim, Nepal, etc., at high elevations, where it is produced in great abundance. The leaves are long, linear, acute, petioled, of a dark, shining green color, and in much demand by the inhabitants as a substitute for tea. This species is very distinct from the *Torreya nucifera* of Zuccarini, although frequently and erroneously confounded with it by writers on the plants of India. It may possibly succeed with us, having proven quite hardy in England.

7. *T. Floridana*, Nuttall.—Is a pretty species from Florida, growing near the Apalachicola River, where it assumes the height of from 10 to 20 or 30 feet. The leaves are quite narrow, mucronate, with revolute margins, and about the same color as the common Yew. Nuttall considered it nearly allied to the *T. brevifolia*, but occupying a very different geographical range. The same author first named it *T. montana*. It is described in Chapman's

Flora of the Southern States. This may possibly succeed in cultivation as far north as Philadelphia, where the *Torreya taxifolia* will flourish, but we are unable to say at present.

28.—TORREYA, *Arnott.*

Flowers axillary and diœcious. Sterile aments, solitary, oblong, or globular. Anther cells 4, attached to the under side of the shield-shaped scale. Fertile aments either solitary, or in clusters of two or three, containing a solitary, erect ovule. Fruit, a drupe, one-seeded, devoid of the fleshy disk at the base, and with the embryo at the apex of hard, ruminated albumen. Cotyledons, 2. Leaves mostly distichous, linear, persistent. Branches in whorls, and producing scaly buds.

The *Torreyas* are all evergreen trees, and closely allied to the Yew, the principal distinction being in the fruit. The leaves of the *Torreyas* are marked with two longitudinal lines, and are noted for a remarkable and repugnant odor, that is emitted from them when bruised or burned. They are generally small trees, and are natives of our Southern States, California, China, and Japan. This genus was named in honor of Prof. John Torrey, of New York.

1. T. Californica, *Torrey.*—CALIFORNIAN NUTMEG TREE.—Syn. *T. myristica*, *Hooker.*—Leaves, from 2 to 2½ inches long, linear, mostly distichous, mucronate, decurrent, short-petioled, pale-green color. Branches, spreading, with the buds covered with persistent oval scales. Fruit, 1¼ to 1½ inch in length, elliptic, smooth, green color, and protecting the hard, nut-like seed.

This species is from California, where it is found on the Sierra Nevada Mountains, growing from 20 to 40 feet

high, and forming a round-headed, small, compact tree. According to Dr. Torrey, this species was "first made known to North American botanists by the late Mr. Shelton, who travelled extensively in California," and was afterwards described by Sir Wm. Hooker under the title of *T. myristica*, in the Botanical Magazine. Dr. Bigelow states: "This tree grows from 40 to 50 feet high, with very slender, drooping branches, and a thin, light foliage. The bark is smooth, somewhat resembling that of the common White Mulberry, and the wood hard and firm." In England it has proven quite hardy, and we await with some anxiety its trial in this country. We have a specimen, two feet high, that has hitherto been wintered in a cold frame, but which is now in the open ground for the first time. Other cultivators are also experimenting with it, and we shall soon be able to report on its ability to stand our climate. Its beauty cannot be called in question, as its charming foliage, its peculiar habit of growth, and arrangement of branches, fully entitle it to be considered as a great desideratum.

It is emphatically a plant to be seen, and not handled, as it possesses in an eminent degree the unpleasant odor peculiar to the genus, and which has obtained for it in its native country the significant but inelegant appellation of the "Stinking Yew."

2. *T. nucifera*, Zuccarini.—NUT-BEARING TORREYA.—Leaves from 1 to $1\frac{1}{2}$ inch long, linear, mostly distichous, scattered on the young shoots, coriaceous, flat, short-peduncled, sharply-mucronate, dark glossy green color. Branches, numerous, spreading, with scaly bark. Fruit, $\frac{3}{4}$ of an inch long, $\frac{1}{2}$ of an inch broad, oval or ovate-oblong, with a smooth, glossy, thin, green covering, and hard, bony seed.

A native of the northern portions of Japan, but is cultivated in all parts of that country, and, according to Kämpfer, is a lofty tree, with many opposite, scaly

branches, producing a light wood. Other writers speak of it as growing about 20 or 30 feet in height, and inhabiting the mountains in the islands of Nippon and Sikok, in Japan. As this species is very rare in England, and only in the possession of a few enthusiastic cultivators in this country, our knowledge of its hardiness and habits is necessarily quite limited.

We have not tested it thoroughly in the open ground, but have grown it for a few years past as a pot-plant, to our great satisfaction. Our own small experience would lead us to believe that it may be recommended for trial with excellent chances of success.

The branches are usually in whorls, but are occasionally disposed alternately, or scattered, and the bark is very scaly. The branchlets are numerous, quite short, and generally distichous. The oil extracted from the kernel of the seed is very astringent and unpalatable, but, according to Kæmpfer, it is used for culinary purposes.

3. *T. taxifolia*, Arnott.—YEW-LEAVED TORREYA.—Leaves, from 1 to $1\frac{1}{2}$ inch long, linear, very sharp-pointed, rigid, almost sessile, pungent, coriaceous, pale shining green color. Branches, horizontal, spreading, with opposite, 2-ranked branchlets. Fruit, about the size and shape of a nutmeg, with a smooth, glaucous covering, and a hard, bony testa.

According to Chapman, this native *Torreya* is found in rich soil, along the east bank of the Apalachicola River, in Middle Florida. Nuttall, in describing it, says: "This stately evergreen, resembling the Yew, was discovered in Middle Florida, by the late lamented H. B. Croom, of Tallahassee, and is sufficiently abundant around *Aspalaga* to be used as timber, and sawed into planks. Prof. Torrey and Mr. Croom describe it as a tree of from 6 to 18 inches in diameter, and from 20 to 40 feet high, with numerous spreading branches, the branchlets dividing into threes; its

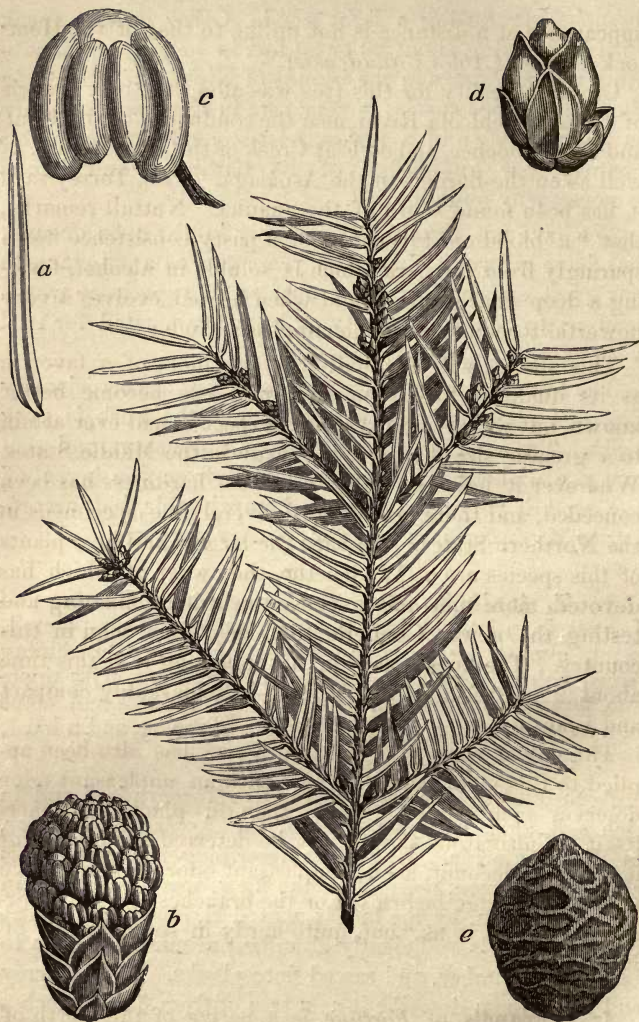


Fig. 62.—*TORREYA TAXIFOLIA*.—A BRANCH TWO-THIRDS NATURAL SIZE; *a*, A LEAF OF FULL SIZE; *b*, A STAMINATE AMENT; *c*, AN ANTHER; *d*, THE PISTILLATE AMENT, ALL MUCH MAGNIFIED; *e*, A FRUIT OF NATURAL SIZE.

appearance at a distance is not unlike to that of the Hemlock Spruce, (*Abies Canadensis*)."

Croom's locality for this tree was along the east branch of the Apalachicola River, near the confluence of the Flint and Chatahoochee, and on Flat Creek of the same stream, as well as on the borders of the Aspalaga. Prof. Torrey says it has been found south of the Suanna. Nuttall remarks, that "a blood-red turpentine of a pasty consistence flows sparingly from the bark which is soluble in alcohol, forming a deep clear solution, and when heated, evolves a very powerful terebinthinous, but unpleasant odor."

This species will gradually become more of a favorite as its qualities for ornamental purposes become better known, but we have no reason to expect it will ever attain to a greater size than a large shrub in the Middle States. Wherever it has been fully tested, its hardiness has been conceded, and there are already several fine specimens in the Northern States. Perhaps the largest and best plants of this species are at Wodenethe, the owner of which has devoted more time and expense towards acclimating and testing the newer Coniferæ than any other man in this country. The finest plant in his collection is at this time about 9 or 10 feet in height, and is remarkably compact and beautiful.

The vulgar name of "Stinking Yew" has also been applied to this plant, and if a tree with an unpleasant odor deserves such an uncouth title, then this plant richly merits it. Cultivators should not be deterred from planting it on this account, as no unpleasant odor is perceptible unless the foliage be bruised or the branches burned. Gordon speaks of it as "not quite hardy in some parts" of England.

4. T. grandis, of *Fortune*, is a native of the north of China, growing on the mountains, and forming a large-sized, spreading tree. The leaves are not so long as those

of the other species, and are linear-lanceolate, distichous, nearly sessile, acute, dark shining green. The fruit is large, oval, and drupaceous, but devoid of the ruminated albumen, which is one of the characters of this genus. Gordon suggests that it may ultimately be classed with *Cephalotaxus*, and it is certainly not unlike that genus. The fact that the leaves of the *Torreya grandis* are entirely devoid of unpleasant odor, gives probability to the view that it is generically distinct. It is very rare, both in this country and Europe.

29.—CEPHALOTAXUS, Siebold.

Flowers, diœcious, axillary, and pedunculate. Fruit clustered, drupe-like, and containing within a pulpy disk, the solitary nut-like seed. Cotyledons, 2. Leaves, linear, distichous, alternate, persistent, with a single nerve.

This genus is closely allied to *Taxus*, but more nearly resembles *Torreya*, and derives its name from the disposition of the flowers, which are arranged in clusters. The derivation is from "*kephale*," a head, and "*taxis*," arrangement. They are all medium-sized or rather large trees, found in Japan and China, where they are also very generally cultivated by the natives. There is no doubt that in proper situations in this country they may be made available as ornamental shrubs at least.

1. *C. drupacea*, Siebold.—PLUM-FRUITED CEPHALOTAXUS.—Syn. *C. Fortunei* fœmina, *Carriere*, &c.—Leaves medium size, linear, distichous, opposite, slightly falcate, rigid, coriaceous, dark shining green above, and slightly glaucous below. Sterile aments globular and long-peduncled. Branches, somewhat ascending, but mostly horizontal, in whorls, spreading, straight, numerous, with

flat, stiff, short branchlets, and small, imbricated, persistent-scaled, acute buds. Fruit, nearly 1 inch in length, elliptical, purple color, enclosing a solitary seed with a bony testa.

This pretty evergreen, long known and disseminated as the female form of the *C. Fortunii* of Hooker, is now proven, however, to be a distinct species. It grows to the height of 20 or 30 feet, and is a native of China and Japan. We have grown this plant for several years, and find it quite desirable; we presume it is more hardy than the *C. Fortunii*, to which it is closely allied. It has given excellent satisfaction in many other localities where it has been cultivated, especially around Philadelphia, at Laurel Hill Cemetery, &c. At the latter place, in the small family enclosures, we thought it particularly appropriate.

In the grounds of the late John Evans, of Radnor, Pa., is a fine plant, that, from some unknown cause, has formed a low, spreading, straggling bush, although it is entirely hardy there, and annually perfects its flowers, and retains the brilliancy of its foliage unimpaired. This peculiarity of form may be owing in a great measure to the effects of our severe winters upon the leading shoots at a time when the plant was young and tender.

In its native country it forms a medium-sized tree, with long, spreading branches, disposed mostly in regular whorls. Although the leaves are naturally of a dark shining green, they nevertheless present to the American cultivator a pale yellowish-green color in most instances—not a sickly hue, but a charming shade of verdure that contrasts prettily with such shades of green as are natural to the Yew, and some of the trailing Junipers.

The fruit is said to be particularly handsome, resembling large purple plums in size and color.

2. *C. Fortunii*, Hooker.—FORTUNE'S CEPHALOTAXUS.—Syn. *C. Fortunii pendula*, *Carriere*; *C. Fortunii mas*, *Hort.*—Leaves very long, linear, inclining to lanceolate,

distichous, flat, almost sessile, smooth, dark shining green above, and somewhat glaucous below. Sterile aments, short-peduncled, globular. Branches spreading and drooping, long, slender; with long, filiform, scattered branch-



Fig. 63.—*CEPHALOTAXUS FORTUNII*.—BRANCH ONE-QUARTER SIZE, WITH SINGLE LEAF OF LIFE SIZE.

lets; and small buds with acute, persistent, imbricated scales. Fruit, very large, from 1 to $1\frac{1}{4}$ inch long, and about $\frac{3}{4}$ of an inch in width, elliptical, with a solitary,

thin-shelled, nut-like seed, covered with a thin, pulpy, purplish flesh when mature.

This fine species is a native of the same localities as the preceding, but is readily distinguished from it by its larger and coarser growth. The branches of this species are placed in regular whorls, and are long and slender, becoming pendulous at the extremities. The leaves are very large and distinct. We have found it hardy, and presume it will be one of the most desirable small Conifers, in the vicinity of Philadelphia at least. During the winter, the foliage becomes somewhat browned, but on the appearance of warm weather it again assumes the glossy green color that adds so materially to its beauty.

There is a peculiar oriental aspect in this tree that reminds one of a fine healthy *Cunninghamia* or the rarer *Araucarias*; and as these plants will never succeed here, we may find an acceptable substitute in this elegant species. During the first few years after planting, the young trees should have a slight protection afforded them by simply placing a few evergreen boughs over their tops in such a manner as to prevent the direct influence of the sun; otherwise the tender, succulent shoots on young plants are liable to be injured.

Planters should always bear in mind that the sun during winter is a much more deadly enemy to half-hardy plants than intense cold.



ADDITIONAL LIST OF CEPHALOTAXUS.

We are not aware that either of the following species has been tested in this country, but as they have been pronounced by English writers to be entirely hardy with them, we may hope to enjoy their beauty at no distant date.

3. *C. pedunculata*, *Siebold*.—Is a beautiful, large species from Japan, frequently attaining the height of 20 or 25 feet. It is occasionally sold under the synonym of *Taxus Harringtonii*, Loudon, and also known as *Taxus Sinensis*, Knight, as well as *Taxus Inukaja*, of the same author, the latter appellation meaning literally a "Wild Yew." The leaves are very long, dark, and glossy, and the tree produces large, drupaceous fruit, borne on long peduncles; hence its specific name. It is reported to be very handsome and desirable.

4. *C. umbraculifera*, *Siebold*.—Is another Japanese species, with shorter leaves than the preceding, but also very dark and glossy. The branches spread out horizontally, and are arranged in regular whorls. The fruit borne by this species is perhaps the largest of the genus, being about the size of a small walnut. It is also found growing in the northern portions of China, and we may hope that it will succeed with us.



30.—**PODOCARPUS**, *L'Heritier*.

Flowers axillary, and mostly diœcious. Fruit, drupe-like and inverted, with a bony testa to the seeds. Cotyledons, 2. Leaves, one-nerved, opposite, alternate or scattered, linear or oblong.

So few species out of this very large genus will survive our winters, that until within a few years past the whole appeared to be proscribed in this country. But as a portion of them became better known and more fully tested, this prejudice against them passed away, and we may confidently expect to succeed with a few of the hardier kinds.

The derivation of the name is from the Greek "*pous*,"

a foot, and "*karpos*," a fruit, in allusion to the long peduncle which supports the flowers and fruit.

This extensive genus embraces about 50 species with numerous varieties, and through the exertions of explorers, the number is gradually increasing. We shall describe only two or three species, that will perhaps prove hardy here, and merely enumerate the remaining kinds, with a few notes on each.

1. *P. coriacea*, Richard.—LEATHERY-LEAVED *PODOCARPUS*.—Syn. *Taxus coriacea*, of some European collectors. Leaves, long, lanceolate, very nearly sessile, coriaceous, somewhat obtuse, deep glossy-green color. Branches, horizontal and spreading. Fruit, quite small, with short peduncles; and with a curved, oval-oblong, hard seed.

As there appears to be some confusion arising from the name of this species, we may question the identity of the specimens in our possession. These plants answer the description given by European authors, excepting in regard to manner of growth and hardness. The mature tree, according to the best authorities, has horizontal, spreading branches; whereas in the young plants that have come under the writer's observation, they are invariably erect. As to hardness, they will endure our coldest winters without protection; whilst in England they are reported "not hardy." We do not feel confident of possessing the true *P. coriacea*, but we do feel satisfied that we have a very valuable, hardy, and beautiful evergreen under this name.

The true species is from the Blue Mountains of Jamaica and adjacent islands, where it forms a handsome tree with mostly slender, spreading branches, which are tuberculated by the decaying leaves. It grows generally to the height of 40 or 50 feet.

2. *P. Japonica*, Siebold.—JAPAN *PODOCARPUS*.—Leaves, very large, 4 to 8 inches long, and $\frac{1}{2}$ inch wide, linear-lanceolate, obtuse, rigid, coriaceous, very dark green color. Branches erect, with few branchlets. Fruit unknown.

Wherever this species has been tested in the open air,



Fig. 64.—*PODOCARPUS JAPONICA*, TWO-THIRD
LIFE SIZE.

we are pleased to learn that it is succeeding in a manner that gives promise of future usefulness. At Parsons & Co.'s, Flushing, L. I., and at Wodenethe, on the Hudson, there are young plants that are now giving great satisfaction. Its rich, dark glossy foliage gives a peculiar, yet charming appearance to this plant, that eminently fits it for cemetery purposes, and makes it preferable to the Irish Yew, which it resembles in manner of growth.

Dr. Siebold, who first introduced this plant from Japan, states it is a beautiful small tree in that country, but we have nothing further concerning it. In Sargent's edition

of Downing's Landscape Gardening, the author thus speaks of it: "*P. Japonica* seems the best known as yet, and the hardiest; our specimens have been through two winters without any injury; it is certainly with us quite as hardy as the Irish Yew."

3. *P. nubigæna*, Lindley.—NUBIGEAN *PODOCARPUS*.—Leaves linear or linear-lanceolate, of medium length, acute, flat, coriaceous, dark green above, slightly glaucous below. Branches, numerous. Fruit, oblong, solitary, axillary, with short peduncles, with the seed incurved at the apex.

A new and rare species recently introduced from Patagonia and Chili, where it frequents the coldest localities on the mountains, and forms a large-sized tree. This plant is also alluded to in Sargent's edition of Downing's Landscape Gardening, as follows: "There is one other variety (species?) not yet received into this country to our knowledge, which promises better than any of the above, viz., *Podocarpus nubigæna*, which is described as one of the finest, as it is unquestionably one of the hardiest and most distinct of all the Conifers introduced within a few years." We may add to this that we received it from Belgium some five years since, and can bear testimony to its exceeding beauty. Our plant stood the winter admirably, but was accidentally destroyed a short time afterward. As it is yet so new and scarce, it will perhaps be some time before it will become well known, and we therefore refrain from recommending it as entirely hardy; but we sincerely trust it may be thoroughly tested in different sections of our country as speedily as possible.

ADDITIONAL LIST OF *PODOCARPUS*.

As already stated, the species of *Podocarpus* are so numerous, and for the most part tender, that we shall give

but a hasty glance at each as we enumerate them in the following list. Believing that the greater portion of them can never be acclimated, in the Northern States at least, we shall be performing a duty by recommending them for pot-culture.

For this purpose they are unexceptionable, and are highly deserving of cultivation, especially when placed in groups upon the lawn with the pots sunken in the ground. In the beautiful collection of the late Wm. Reid, of Elizabethtown, N. J., we remember this grouping of evergreens was one of the owner's favorite modes of planting, and the most attractive feature of the place.

The erect form, and rich, dark glossy-green color of the larger portion of the genus, are admirably adapted to contrast with the pendulous habit and lighter verdure of many other tender plants, especially the rare and graceful *Dacridiums*, *Juniperus*, etc. The following list comprises the greater portion of the known species and varieties, according to Gordon, from whose work on Conifers they have been mainly compiled.

4. *P. Alpina*, *Brown*.—Said to grow on Mount Wellington, in Tasmania.

5. *P. Antarctica*, *Van Houtte*.—Is a large tree growing on the Andes in Chili and Patagonia.

6. *P. amara*, *Blume*.—Is a very tender species from the Island of Java, where it forms an immense tree 200 feet in height.

7. *P. Andina*, *Pœppig*.—A new and rare species, which may prove hardy in this country. It is from the colder portions of Chili, growing from 10 to 20 feet in height, and with numerous branches densely clothed with dark green, shining, leathery leaves.

8. *P. Bidwilli*, *Hoibrenk*.—Is another uncertain species introduced from New Holland, but of whose history but very little is known.

9. *P. bracteata*, *Blume*.—A fine, large species found in Java, and in the forests that skirt the mountains of Burangrang. It generally reaches the height of 80 feet, with a tall, straight trunk, and spreading, horizontal branches. It derives its specific name from the large bractiform involucre at the base of the fertile flowers.

Var. brevipes, *Blume*.—Is from the same locality, and has shorter and narrower leaves, and smaller fruit.

10. *P. Chiliana*, *Richard*.—Is very frequent on the Chilian Mountains, where it grows to the height of 40 feet. It has numerous branches covered with bright green leaves from 3 to 4 inches long.

11. *P. Chinensis*, *Wallich*.—A small-sized tree from Japan and China, which was mistaken for a *Taxus* by Roxburgh and others. It has various synonyms given it by Endlicher, Siebold, etc. The branches are erect and spreading, and the leaves pale glaucous-green. Possibly this may prove hardy with us.

Var. aurea, and *var. argentea*, *Gordon*.—Are two very beautiful plants sent to England to the Royal Bagshot Nursery, in 1861, by Fortune, from Japan.

12. *P. cupressina*, *Brown*.—Grows to the height of 180 feet, and is a native of Java and the Philippine Islands. It is very tender, although exceedingly beautiful.

13. *P. corrugata*, *Gordon*.—A small-sized tree or large shrub from Yeddo, where it is cultivated in the gardens. Introduced into England by Fortune, in 1861. The foli-

age is delicately and beautifully variegated. There is also a probability of this handsome species succeeding here.

14. *P. discolor*, Blume.—Another species found in Japan on the most elevated mountains; it forms a large-sized tree. Not hardy.

15. *P. dacryoides*, Richard.—One of the largest of the genus, as well as one of the most tender. It comes from New Zealand, where it assumes the height of 200 feet, with long, drooping, and spreading branches.

16. *P. elata*, Brown.—Character somewhat obscured. A native of New Holland, with beautiful large leaves, about 3 or 4 inches in length.

17. *P. elongata*, L'Heritier.—Is known by numerous synonyms, and is one of the most tender species. It is from Abyssinia and the Cape of Good Hope, where it forms a large tree.

18. *P. Endlicherianus*, Carriere.—Is said to be found in the northern parts of India, where it forms a tall tree with numerous ascending branches. Its history, however, is but little known. The leaves are from 4 to 7 inches long, and of a pale green color.

19. *P. ensifolia*, Brown.—From New Holland and Tasmania. A small tree, and undoubtedly tender, with sharply acute leaves 2 or 3 inches long.

20. *P. falcata*, Brown.—Is but little known. Thunberg is supposed to have discovered it at the Cape of Good Hope. The seeds in this species are said to be devoid of the fleshy receptacle.

21. *P. ferruginea*, Don.—Although not hardy, this beautiful tree is well worthy of notice. It comes from New Zealand, where it grows from 40 to 60 feet in height. The numerous leaves are of a rusty-brown color. The timber is of a beautiful reddish tint and very durable.

22. *P. Koraiana*, Siebold.—We have hopes that this handsome little plant may eventually be acclimated with us. It has proven hardy in England, and forms a valuable, erect-growing shrub. A native of the mountains of Japan, but extensively grown there in the gardens.

23. *P. læta*, Hoibrenk.—A tender species from New Holland, forming a tall, straight tree, with few, verticillate branches, and medium-sized, sharp-pointed leaves.

24. *P. Lamberti*, Klotzsch.—A Brazilian plant found in the mountains, and is a large-sized tree. It is a robust grower.

25. *P. Lawrencii*, Hooker.—Is an obscure species from Tasmania, where it was discovered by Gunn. It is a small-sized tree, with pale green leaves and slender branches.

26. *P. leptostachya*, Blume.—Grows to the height of 50 or 60 feet, and comes from the Island of Borneo, where it is abundant in the mountainous districts. Leaves, dull green, from two to five inches in length.

27. *P. macrophylla*, Don.—Has been introduced and grown under several synonyms, and is a tender tree from Japan, where it grows to the height of 40 or 50 feet, and is well adapted for pot-culture with us.

28. *P. neglecta*, Blume.—Is another tender species

from the Island of Java, growing over 100 feet in height. Leaves from two to four inches long, on opposite or whorled branches.

29. *P. nereifolia*, Brown.—Grows about 40 feet in height, and is found in Nepal, etc. Leaves from three to six inches long, and bright green color. It is very tender.

30. *P. nivalis*, Hooker.—A new and unIntroduced species, growing in the northern portion of New Zealand, on the Mountain of Tongariro, and near the perpetual snow limits. It forms a small shrub with oblong, mostly sessile leaves.

31. *P. oleifolia*, Don.—A tender tree from the mountains of Chili, with numerous acute, leathery leaves, borne on smooth, crowded branches.

32. *P. polystachya*, Brown.—Resembles somewhat *P. bracteata*, and is a native of Singapore. It is a large tree, with a branching head and straight stem.

33. *P. Purdieana*, Hooker.—Is from Jamaica, where it grows to the height of 100 feet, and is furnished with horizontal, spreading branches, and bright green, thick, leathery leaves, from 3 to 5 inches long. It is reported as being "very tender."

34. *P. rigida*, Klotzsch.—From Peru, but of which we have not a full description. Leaves very acute, smooth, and shining. Branches, with a smooth yellowish-brown bark, numerous, and densely clothed with leaves.

35. *P. Rumphii*, Blume.—Frequents the most elevated forests of the Moluccas and New Guinea, where it grows to the height of 80 or 100 feet. The leaves are frequently in

whorls, and the branches long and smooth, with a reddish-brown bark.

36. *P. salicifolia*, Klotzsch.—Is from the north-western part of South America, forming a small tree on the mountains. The leaves are long, falcate, leathery, and pale shining green in color. It is tender.

37. *P. Sellowii*, Klotzsch.—Another tender species from the mountains of Brazil, with long, acute, lanceolate leaves, and reported as not hardy.

38. *P. spicata*, Brown.—Resembles the *Dacridiums* so closely as to be classed with that genus by several authors. It frequently grows from 150 to 200 feet, and occasionally even reaches the height of 300 feet, and is found on the Island of New Zealand. Quite tender in England.

39. *P. spinulosa*, Brown.—Is also not hardy, being a native of the eastern portion of New Holland. The branches are slender and spreading, and the leaves leathery, linear, falcate, pungent, and very acute.

40. *P. taxifolia*, Humboldt.—We imported this tree a few years since under the name of *Torreya Humboldtii* of Knight; but as the young shoots were frequently destroyed, we consider it too tender for our climate. The Wodenethe specimen is reported to have stood "three winters without injury," and the owner says "it resembles still more the Irish Yew than the *Podocarpus Japonica*." As our plant had no resemblance to the Irish Yew whatever, it is quite reasonable to infer that one of the plants was incorrect. Gordon says: "Branches ascending, or spreading, but sometimes on old trees drooping." It is a Peruvian species, growing about 60 feet in height, and found on the mountains.

Var. densifolia, Kunth.—Differs in having shorter and more dense foliage than the species, but in all other respects very much like it.

41. P. thevetiæfolia, Blume.—Grows about 40 or 50 feet in height, and was introduced from New Guinea. It has flat, leathery, very straight, sessile leaves, and forked, straggling branches.

42. P. Thunbergii, Hooker.—Another tender, yet beautiful species from the Cape of Good Hope. Tree of large size, with broad, leathery leaves.

43. P. Totara, Don.—The *P. pungens* of Van Houtte's Catalogue, and is a native of the northern island of New Zealand, growing 80 or 90 and even 100 feet high. It is considered one of the finest timber trees in its native country, and has great durability.



31.—DACRIDIUM, Solander.

This genus is composed of six species, with diœcious flowers, and erect, drupaceous fruit, very much like that belonging to the *Taxus*. Leaves opposite, needle-shaped, or scale-formed. The origin of the name is on account of the resinous exudation, and is derived from "*dakru*," signifying a tear.

1. D. Colensoi, Hooker.—Is a new and very beautiful species from New Zealand, growing 50 feet in height, and producing hard and incorruptible timber.

2. D. cupressiforme, Carriere.—Origin uncertain, but

said to grow on the mountains of New Zealand, where it forms a dense bush.

3. *D. cupressinum*, Solander.—Is from New Zealand also, growing on the mountains and reaching the immense height of 200 feet. This magnificent tree has long, drooping branches, and small, scale-like leaves, resembling a *Lycopodium*.

4. *D. elatum*, Wallich.—Has been described as a Juniper by several authors. It comes from the East Indies, where it forms a large tree with numerous branches, densely covered with leaves.

5. *D. Franklinii*, Hooker.—HUON PINE.—This is perhaps one of the most desirable Conifers for pot-culture, when properly cared for and trained. Having had it in our collection for several years, we can bear testimony to its exceeding gracefulness and general beauty. It is a native of Van Dieman's Land, where it grows to the height of 100 feet.

6. *D. laxifolium*, Hooker.—Comes from the mountains of New Zealand likewise. It is there a prostrate, creeping shrub, and is described as being very graceful and slender in growth; and is also, like the preceding species, tolerably hardy in England, which is a sure indication of its succeeding in our Southern States.



32.—**SALISBURIA**, *Smith*.—GINKGO.

Flowers diœcious and pedunculate. Sterile aments, filiform and axillary. Anther-cells pendulous from the lacerated, scale-like, connection. Fertile flowers, solitary, and in terminal fascicles, with the ovule, solitary and

erect. Fruit, drupe-like, standing in the fleshy disk, which covers the base. Cotyledons, 2. Leaves deciduous, plicately-involute in the bud, fan-shaped, long-petioled, and marked with longitudinal nerves.

This curious, yet beautiful genus consists of a single species, which is a native of Japan and portions of China. It was dedicated by Smith to Anthony Salisbury, an English botanist of distinction, although first described and named by Linnæus as *Ginkgo biloba*.

S. adiantifolia, Smith.—MAIDEN-HAIR TREE.—Leaves fan-shaped or wedge-shaped, very broad, and incised at the apex, thick, coriaceous, more or less fasciculate on the adult branches, but distant and scattered on the young shoots, pale green color. Branches, sometimes straggling, mostly ascending or horizontal. Fruit, globular or ovate, one inch in diameter, on long, slender peduncles.

The Ginkgo has always appeared to us an anomaly, differing from all other trees in several particulars. The leaves remind one of a large *Adiantum*-like tree-fern; and the veining is more like that of the monocotyledonous, than the dicotyledonous class to which it belongs. The wood, being entirely devoid of resin, is very apt to mislead the student. The fruit, however, which in almost every instance forms the best criterion, in this case plainly points out its true character.

This tree is a native of Japan and China, and is quite abundant in some provinces, growing to the height of from 40 to 80 feet, and in particular situations 100 feet high, with the trunks from 6 to 12 feet in diameter. There is a vast difference in the form of the tree; those propagated from layers or cuttings are almost invariably crooked, whilst seedlings are generally straight, and present an evenly balanced and conical head. In either case, however, it is very quick-growing, and speedily forms a tree.

The *Salisburia* has long been a favorite with us, and we can heartily endorse the following remarks by one who

made the subject of trees and plants his favorite study, and whom we may all desire to emulate in our appreciation of Nature's works. "The Ginkgo Tree," says the



Fig. 65.—*SALISBURIA ADIANTIFOLIA*, HALF THE NATURAL SIZE.

lamented Downing, "is so great a botanical curiosity, and is so singularly beautiful when clad with its fern-like foliage, that it is strikingly adapted to add ornament and

interest to the pleasure-ground. As the foliage is of that kind which must be viewed near by to understand its peculiarity, and as the form and outline of the tree are pleasing and harmonize well with buildings, we would recommend that it be planted near the house, where its unique character can be readily seen and appreciated."

It was first introduced into this country in the year 1784, by Alexander Hamilton, Esq., of the Woodlands, (of latter years a charming rural cemetery), near Philadelphia. These fine old specimens are yet standing, and form one of the most attractive objects in that beautiful "city of the dead," which was once the arboretum that bore the present appropriate title. Other fine specimens are at Boston, at the old Bartram Garden near Philadelphia, and at Peirce's Park near West Chester, Pa. A specimen of this tree in the Botanical Garden of Pisa is 75 feet high and 3 feet in diameter.

In regard to the rapid growth of this species, we give the following account of a specimen growing near Montpellier, taken from the Gardener's Chronicle: "In the year 1788, Broussonet, who was then in London, sent to Prof. Gouan, of Montpellier, a plant of this species, for which he was indebted to Sir Joseph Banks. In 1812, twenty-four years after being planted, the tree flowered. At that time it was $9\frac{1}{2}$ yards high. In June, 1835, it was rather more than $17\frac{1}{2}$ yards high. On Dec. 7th, 1853, its stature was determined by careful measurement to be $19\frac{3}{4}$ yards, or a trifle more. From this it appears that it lengthened on an average not quite a foot annually; but it in reality grew nearly three times as fast in the first 47 years, as in the last 18."

It has proven quite hardy throughout the Middle States, excepting perhaps in the more northern parts of New York and Pennsylvania. A fine specimen is mentioned by Prof. Bunge, who accompanied the Russian mission to Peking, that was near 40 feet in circumference, and of pro-

digious height. It was standing near a pagoda, and appeared to be in full vigor.

Var. macrophylla, Hort.—Is also known as *var. laciniata*, Carriere, and is but little different from the true form. The leaves are larger, more numerously divided, and jagged on the edges.

Var. variegata, Carriere.—Considered by some as striking, on account of the golden yellow stripes on the foliage. We, however, prefer the beautiful green color that is natural to the tree, and leave this variety to those who prefer to have the foliage disfigured.

Cultivators are constantly introducing new varieties, and we see that the *Salisburia* is also contributing varieties to the general list, but in the absence of any positive information we shall not enumerate them.



33.—**PHYLLOCLADUS**, *Richard.*

Has terminal, clustered, monœcious flowers; and small, solitary, nut-like seeds, with a fleshy disk at the base, much resembling *Taxus*. The leaves are very small and scale-like, and the branchlets resemble feathery, pinnate leaves. From this latter peculiarity the genus derives its name. All the species are tender.

1. **P. Alpina, Hooker.**—Is a small, dense-growing shrub from New Zealand, etc.

2. **P. glauca, Carriere.**—Is an uncertain species with glaucous leaves. Origin unknown.

3. **P. hypophylla, Hooker.**—A large tree from Borneo, of which little is known.

4. *P. rhomboidalis*, *Richard*.—Grows on the mountains of Tasmania, and forms a beautiful tree 40 or 50 feet in height.

5. *P. trichomanoides*, *Don*.—This species, the largest of the genus, is from New Zealand, where it attains the height of 60 or 70 feet, and is a very handsome, straight tree, with spreading branches.



34.—MICROCACHRYS, *Hooker*.

Flowers monœcious, terminal flowers; cones very small cylindrical strobiles, with imbricated, ovate, spreading scales. It derives its name from the exceedingly small cones.

M. tetragona, *Hooker*.—This species forms a small tree, with very numerous, slender branches, and very small Dacridium-like leaves.

There is also an uncertain genus with one species, found in Van Diemen's Land, which, according to Gordon, is a tender, evergreen bush. It is known as *Pherosphæra Hookeriana*, *Archer*.



35.—SAXE-GOTHÆA, *Lindley*.

Is a comparatively new genus, with monœcious flowers, and a fleshy, drupe-like fruit. The leaves are mostly distichous, coriaceous, and bright green in color. It was named in compliment to the late Prince Albert of England.

S. conspicua, *Lindley*.—Is the only species known, and is a curious, small tree from the mountains of Patagonia, frequently growing 30 feet high. It is very handsome, but tender.

36.—NAGEIA, *Gærtner*.

This genus has either monœcious or diœcious flowers, and globular, drupaceous fruit. The name is from the Japanese appellation of *Na*, or *Nagi*, meaning Catkin-bearing. These six species, all of which are tender, are merely enumerated here.

1. **N. Blumei**, *Gordon*.—Is a tree 70 or 80 feet in height, growing on the mountains of Java.

2. **N. cuspidata**, *Gordon*.—Is quite a small tree from Jezo, in Japan.

3. **N. grandiflora**, *Gordon*.—Is supposed to be a native of China and Japan, but little known.

4. **N. Japonica**, *Gærtner*.—Is very frequent on the Japanese mountains, where it forms a large-sized tree. A beautiful variegated form of this species has been sent to England by Fortune.

5. **N. latifolia**, *Gordon*.—Is from 20 to 30 feet in height, and comes from the mountains in Eastern Bengal.

6. **N. ovata**, *Gordon*.—Is from Yeddo, Japan, forming a large shrub or small tree, and but very recently introduced into England. There is also a very pretty variegated form of it, sent over at the same time by the indefatigable collector, Fortune.

VEITCHIA, *Lindley*.

A new genus named in honor of its discoverer, Mr. J. G. Veitch; its real position in the family being as yet unsettled, we place it here. There is but one species, of which we append Dr. Lindley's account, as published in the Gardener's Chronicle.

Veitchia Japonica, *Lindley*.—"Of this extraordinary plant only two mutilated cones, a few seeds, and a small branch have been received; but they suffice to show that it is a wholly new form in the coniferous order, with the seeds of *Chamæcyparis*, the leaves of an *Abies*, and cones which become, when ripe, more like spherical honeycombs than anything else to which we can compare them. One would fancy the plant to represent an *Abies*, permanently assuming in the cone the monstrous form so often given to the common Spruce by the attack of insects, and then struggling onwards to become a *Sciadopitys*, or a *Cryptomeria*.

The branches are short, and covered with spirally arranged, projecting, curled pulvines, resembling those of *Abies Menziesii*. At the base of each branchlet is a small cup formed of recurved scales, from which the branchlet emerged when young. The leaves are $\frac{1}{2}$ inch long, linear, blunt, and glaucous beneath. The cones are erect, downy, nearly spherical, about 1 inch in diameter; before ripening, furnished with incurved, horn-like, projecting, bracteal scales, which, at maturity, break and disclose as many four-sided sockets or cavities, within which lodge a (to us uncertain) number of small, two-winged seeds, terminated by a pair of short, straight, tooth-like processes."

CHAPTER XIII.

NOTICES OF COLLECTIONS OF CONIFERS.

“Give fools their gold, and knaves their power,
Let fortune’s bubbles rise and fall;
Who sows a field, or trains a flower,
Or plants a tree, is more than all.”—*J. G. Whittier.*

We think it advisable to introduce notices of some of the best collections of Coniferæ in this country. With regard to plantations of these trees, we are vastly behind our transatlantic brethren; for whilst they boast of their extensive pinetums and costly collections of Conifers, our ambition, as a general thing, has been satisfied with a small lawn, enriched with a few choice trees. But for the excellent little gardens of Bartram, Marshall, the Peirces, and one or two in the Eastern States, America has had nothing to boast of in this respect.

Since the commencement of this work we have been agreeably surprised to find this family of plants becoming popular; and an interest has been awakened through the influence of a few true lovers of the beautiful, who have taken the lead in this good work. The indications now are that America will, at no distant day, be celebrated for her interest in arboriculture, as well as for her fine collections of trees. Even now we are having parks planned as in New York, and botanical gardens laid out as at St. Louis, affording examples which are certain to be followed. Once make a commencement in any good work, and other important results are always sure to follow.

It is highly proper that the following descriptions should commence with the first botanical garden established on this continent. On the banks of the Schuylkill, below Philadelphia, in a quiet, secluded spot, that pioneer of American botany, John Bartram, laid the foundation of his garden, which, among scientific men, of all countries, has been the Mecca of their pilgrimage when visiting our shores. Simple, plain, and unpretending in character, devoid of all the embellishments of art, and the extravagant systems of the old world, this beautiful rural spot, owing to the care of its succeeding owners, has been handed down to us in almost its original form.

The Bartram Botanic Garden was established in or about the year 1730. Its founder, John Bartram, about this time commenced forming that collection, which, taking into consideration the slender means at his disposal, and the comparatively meagre knowledge of the age in which he lived, culminated in a truly marvellous work. The Coniferæ known at that period are well represented in the truly magnificent specimens yet to be seen in this collection. To the sizes of most of these trees, we are indebted to that interesting little work "The American Hand-book of Ornamental Trees," by Thomas Meehan. As the majority of the Conifers here consist of the older well-known species, we shall merely call attention to such as are remarkable for size and vigor.

The best specimen of the Hemlock Spruce, *Abies Canadensis*, is about 94 feet high, and 8 feet 4 inches in circumference. A fine tree of the Norway Spruce, *Abies excelsa*, is 120 feet high, and 7 feet 2 inches in circumference; it is beautifully formed, and regularly furnished with drooping branches to within a short distance of the ground. A specimen of the White Cedar, *Cupressus thyoides*, although growing in a rather dry situation, is here 20 feet high. One of the finest plants of the Common Juniper, *Juniperus communis*, in cultivation, is to be seen at this

place. It is growing in a perfectly natural manner, without any pruning or cultivation whatever, and is now about 35 feet high and $2\frac{1}{2}$ feet in circumference. The European Larch, *Larix Europea*, and the American Larch, *Larix Americana*, are well represented by excellent specimens. The best of the former is now 108 feet high and 5 feet 4 inches in circumference; whilst the latter, although comparatively young, is 40 feet high and $2\frac{3}{4}$ feet in circumference.

Among the Pines is a very good Jersey Pine, *P. inops*, 62 feet high and 3 feet in circumference. The Northern Yellow Pine, *P. mitis*, is 90 feet high and 4 feet 8 inches in circumference. Pitch Pine, *P. rigida*, although growing in a rocky situation with very little earth, is now about 54 feet high and $4\frac{1}{2}$ feet in circumference. The best White Pine, *P. Strobus*, a glorious tree, by the way, is 118 feet high and $7\frac{1}{4}$ feet in circumference. The Scotch Pine, *P. sylvestris*, is about 35 feet high and 3 feet in circumference. A very good specimen of the Maiden-Hair Tree, or Japan Ginkgo, *Salisburia adiantifolia*, is to be seen in this collection; and, although perhaps somewhat inferior to the old Hamilton trees, is 61 feet high and 3 feet 8 inches in circumference. The Deciduous Cypress, *Taxodium distichum*, is one of the most attractive features in these gardens, being about 125 feet high and 20 feet in circumference. The best American Arbor Vitæ, *Thuja occidentalis*, is 52 feet high, and 3 feet 10 inches in circumference; whilst the finest plant of the Chinese Arbor Vitæ, *Biota Orientalis*, is 25 feet high and 3 feet in circumference. The Bartram collection also embraces many splendid specimens of deciduous trees.

The second botanical garden in this country was located at Marshallton, Chester Co., Pa., in the year 1773. Humphrey Marshall, the proprietor of these grounds, was a cousin to John Bartram; and to his association and correspondence with his talented relative may possibly be at-

tributed Marshall's love for botany, as the latter did not commence planting his garden until he was 51 years of age. Previous to this, however, he had become quite celebrated as a collector of seeds and young plants for European botanists.

These grounds are at the present time sadly neglected, and but a few of the original trees remain; yet they remind the visitor of that deep-seated love for nature, which, amidst all the difficulties attending a pioneer in science, influenced his declining years. Here lived and died the first American author on trees and plants, a self-made, self-educated man.

These grounds at the present time contain so few specimens of the Coniferæ, that it is not necessary to enumerate them here. A few of the commoner species of Pines and Firs are all that now remain; and in a few short years these too will, in all probability, be cut for fuel, as this appears to be all the value our country friends see in them.

About the year 1800 two brothers, Joshua and Samuel Peirce, residing a few miles south-west of West Chester, Pa., commenced their collection of trees, consisting principally of the well-known Conifers. They were mostly planted in a double avenue, extending some distance from their dwelling to a beautiful small lake at the rear of the premises. After a lapse of sixty-seven years, these trees have grown to an immense size, and present the most imposing sight imaginable. This little select arboretum is, as Dr. Darlington has recorded, "certainly unrivalled in Pennsylvania, and probably not surpassed in these United States." A few years since there appeared in the Horticulturist a series of articles, entitled, "The Parks and Pleasure Grounds of Pennsylvania," written by a talented correspondent signed "*B.*" One of these contributions was devoted to a description of Peirce's Park, and in it

the writer speaks most eloquently of the pines and firs embraced therein.

One of the oldest private arboretums in this country that has been enriched with the introductions of latter years, is the fine collection planted by the late John Evans, in Radnor Township, Delaware Co., Pa. This place, although unadorned by any artificial arrangements, and executed with a total disregard of the rules of landscape-gardening, is, notwithstanding, one of the most picturesque and natural spots we have ever beheld. The hilly slope is ornamented by masses and solitary specimens of Conifers; the drooping branches of the Douglas' Spruce being relieved by the rigid form of almost innumerable pines, whilst the dark sombre hue of the former contrasts charmingly with the lighter verdure of the latter.

Along the little valleys and bordering the streams, are placed Hemlocks and Pichta Fir, with numerous other Conifers that prefer a moist locality; and in the sheltered nooks and warmer corners, the rare and doubtful Cunninghamias and Cryptomerias grow with vigor. In this collection we would enumerate as being particularly fine, one of the best specimens of the *Abies Douglasii* to be found in the Eastern States. It is now about 25 feet high, and, with one exception, when the leading shoot was destroyed, this tree has grown as luxuriantly as its brethren on the Pacific coast. The richness of the foliage, the play of light and shadow as the branches wave and tremble in the passing breeze, the graceful pendent boughs, and the unusually majestic appearance of the tree, cannot but excite admiration.

Another excellent plant in this collection, and doubtless the best in the States, is a large *Abies Pichta* about 15 feet high. This specimen is regularly conical in form, and as dense and compact as any Conifer we have ever seen. The color of the foliage is of that peculiar hue which, seen in a strong light, displays a rich glaucousness;

but when thrown into shadow, becomes the darkest shade of green. The *Cunninghamia Sinensis* is 10 feet high, and to all present appearances, will prove hardy.

The *Cryptomerias* at this place are perhaps 15 feet in height, but are lacking in denseness, which detracts from their otherwise luxuriant appearance. An old tree of the *Pinus Lambertiana*, now 25 or 30 feet in height, has for several years been perfecting its fruit on these grounds, and is one of the attractions of the collection. In a low, moist piece of ground, a fine large *Glyptostrobus pendulus* is luxuriating, and is entirely hardy and remarkably beautiful.

At Wodenethe is the beautiful and well-preserved collection of Henry Winthrop Sargent, Esq., situated on the Hudson at Fishkill Landing, opposite Newburgh, N. Y. As this arboretum has now become so justly celebrated throughout our country as a model place, and been so frequently described in the various horticultural periodicals, it seems almost superfluous in us to go over the same ground here. Yet during a recent visit to the place we were so deeply interested and instructed in viewing the many new and to us strange introductions, that we notice some of them.

Near the mansion are two very handsome specimens of the *Araucaria imbricata*, grown in boxes. These had attained the height of 5 or 6 feet, and were perfect examples of this species in a young state. Near these we noticed a remarkable variety of the Hemlock Spruce, of dwarfish habit, with long, drooping branchlets, and altogether quite unique in character. This plant was found growing on the mountains near by. In a beautiful spot, formed by an opening in the original growth of trees, we were introduced to a recent plantation of novelties, amongst which were an *Abies Pinsapo*, 7 feet in height; several fine plants of *Cephalotaxus drupacea*; *Cupressus Nutkaensis*, and *C. Lawsoniana*; *Sequoia gigantea*, etc., etc. A number

of Golden Yews near by, many of which were 6 or 7 feet in height, were exceedingly attractive and handsome.

The new Golden Larch, *Pseudolarix Kämpferi*, a fine long-leaved species, we here saw for the first time. Its peculiar golden tint and rapid growth will entitle it to favor, should it prove in the future as hardy as we confidently believe it will. Among the Firs and Spruces were very many excellent specimens, doubtless unexcelled in the country: *Abies Nordmanniana*, 7 feet high; one specimen of *A. Cephalonica*, 20 feet, and another, 10 or 12 feet; *Abies Menziesii*, 10 feet; *A. Orientalis*, 7 feet; beautiful specimens of *Abies Douglasii*; and quite a number of dwarf varieties of Spruces. Among the Pines were *Pinus Cembra*, 10 or 12 feet; *P. ponderosa*, 40 or 50 feet, and perhaps the best specimen in cultivation; as well as excellent plants of *P. sylvestris variegata*, *P. Lambertiana*, *P. Gerardiana*, etc.

Our attention was particularly attracted to a collection of tender Conifers grown in boxes, and sunken in the ground, the most noticeable of which were *Araucaria excelsa*, and *A. Cunninghamia*, with *Cunninghamia Braziliensis*, etc., all probably 10 or 12 feet in height. The large number of variegated and erect Yews, that were scattered through various parts of the grounds, added greatly to the interest of the collection. The newer Japan Coniferæ, especially *Thuopsis dolabrata*, and its variegated variety, were well represented here.

The best commercial collection is undoubtedly that of Parsons & Co., at Flushing, L. I., where may be seen specimens of almost every Conifer that will endure our climate; and as it is annually enriched with the newer introductions as soon as brought to notice, the visitor is always amply repaid by a walk through these grounds. The magnificent collection of Rhododendrons and other plants also adds greatly to its attractions. These nurseries are particularly rich in the many new dwarf varieties that are

constantly being produced abroad; and as the greater part are as yet scarce and almost unknown in our private collections, we will note a few of the finest and most distinct: *Juniperus communis*, var. *Suecica nana*; *J. c.* var. *Hibernica compressa*; *Abies excelsa*, var. *pumila*; *A. e.*, var. *pygmæa*; *A. e.*, var. *Gregoriana*; *A. e.*, var. *Clanbrasiliana*; *Thuja Occidentalis*, var. *minima*; *Juniperus prostrata*, var. *Americana*; *Biota Orientalis*, var. *pygmæa*; *Pinus Strobus*, var. *nana*; *Abies Canadensis*, var. *pumila* (of Parsons); *Pinus Strobus*, var. *pumila*; etc., etc. When gathered together in clumps, these pretty miniature evergreens are very attractive.

The new and rare *Pseudolarix Kämpferi* is well represented here by perhaps the finest specimen in the country. It is now about 8 feet high, and very healthy. A *Picea Nordmanniana* is at least 10 feet high, and combines all the requisites we could desire in an ornamental tree. Two very fine young trees of the *Picea Cephalonica* present abundant evidence of their adaptation to our climate, and are 15 feet in height. A beautiful *Taxus baccata*, var. *erecta*, is about 8 feet high, and attracts considerable attention, not only for its rich, dark green foliage, but for its healthy growth, peculiar form, and entire hardiness. Excellent specimens of *Abies (Picea) grandis* are growing here in a high state of perfection, and are probably the finest in the States. The numerous, and, in many instances, grotesque varieties of *Abies excelsa*, are quite interesting from their contorted and curious forms and manner of growth. An excellent example of the new species, *Abies (Picea) Cilicica*, is here, very distinct from the Common Silver Fir. A striking, and rather odd-looking plant, we found during a recent visit in the variegated form of *Cupressus thyoides*, which was perfectly healthy, and about 8 feet high.

Biota Orientalis, var. *gracilis*, is at this place remarkably fine and distinct. Superb trees of *Abies Menziesii*

and *Pinus Cembra*, are well represented in the collection; the former about 15 feet, and the latter 10 feet in height. But the crowning feature of the whole place, in our eyes, is the beautiful specimens of *Cupressus Lawsoniana*, the best of which are perhaps 12 feet or more in height, and perfect in outline. We understand they are hardy in this vicinity.

The largest and best collection of Conifers in the Eastern States is doubtless to be found at Wellesley, near Boston, Mass., the beautiful grounds of H. H. Hunnewell, Esq.; and although of comparatively recent formation, they present one of the finest examples of modern landscape gardening to be found in the country. Here may be seen long avenues of the hardy old species, such as White Pine, Larch, Norway Spruce, and that charming species, the Bhotan Pine, (*P. excelsa*).

The rarer Coniferæ are well represented by excellent specimens of such kinds as *Abies Pichta*, *A. Nordmanniana*, *A. Cephalonica*, *A. Douglasii*, *Cryptomeria Japonica*, and *Cupressus Lawsoniana*. These are about 8 or 10 feet in height. There are also good plants, although small, of many other species, such as the *Pseudolarix Kæmpferi*, various *Retinosporas*, *Thuopsis dolabrata*, etc., all giving promise of proving valuable here under the care bestowed upon them. The proprietor of this fine collection has already prepared a suitable portion of ground for a complete pinetum of all Conifers that will survive our winters, the first of the kind in the United States, and which will be of immense advantage to the public in the future.

At the celebrated Bloomsdale Seed Farm, near Philadelphia, are perhaps as fine specimens of a few of the rarer Conifers as can be found in the country, particularly of the *Abies (Picea) Cephalonica*. We regret not having the exact sizes of some of the trees. Near by, at the Sher-

wood Nursery, is also an excellent collection, containing many species of the newer kinds.

At Princeton, N. J., in the excellent collection of R. S. Field, Esq., may be found some of the largest and best specimens of the rarer Coniferæ to be seen in the Northern States. The planting of these grounds was commenced some twenty years ago, and the oldest specimens of Norway Spruce, White Pine, etc., have already attained the height of fifty feet. The greater portion of these having been planted along the northern boundary of the premises, now present an impassable barrier to the cold winds of winter, and to this may be attributed the success with many of the half-hardy plants in this collection. The proprietor shows a well-deserved partiality for the Norway Spruce, White Pine, European Silver Fir, White Spruce, and American Arbor Vitæ, and justly deprecates the doubtful merits of the Balsam Fir.

Among the rarer trees to be found here is the Cedar of Lebanon, (*Cedrus Libani*), the largest of which is now about forty feet in height, and has been fruiting for several years. This interesting specimen is frequently injured slightly by the winter, but not sufficiently so to impede its growth.

We take pleasure in recording the success of the Princeton specimens of *Pinus excelsa*, for notwithstanding it seems unwilling to thrive in many localities, its success is almost certain here, in spite of an occasional injury to the leading shoots. The finest plant is now twenty feet high, and beautifully proportioned. Other Pines are not so satisfactory, although receiving as much care and attention. Most of the rarer kinds from the Rocky Mountains and westward are to be found in the collection. The Long-leaved, or Southern Yellow Pine (*P. Australis*) is here, apparently at home, and preserves its elegant bright green color; one plant is fifteen feet high. *Pinus Cembra*

is also quite satisfactory, notwithstanding its very slow growth.

Among the Spruces are the finest specimens of *Abies Smithiana* to be found in the country; and although occasionally suffering during the winter, they have made a growth of over ten feet, and perfected cones. There are likewise fine plants of *A. Menziesii*, *A. Orientalis*, as well as splendid trees of the White Spruce, (*A. alba*). *A. Douglasii* is also represented by an excellent specimen fifteen feet in height.

The Silver Firs embrace all the most desirable species, and are unusually handsome, especially such kinds as *A. amabilis*, *A. Cephalonica*, *A. Fraseri* and its variety *Hudsonica*, *A. nobilis*, *A. Nordmanniana*, *A. grandis*, *A. Pichta*, *A. Pinsapo*, and *A. Pindrow*, some of which are from ten to fifteen feet high. *A. Cephalonica* and *A. Pichta* perhaps succeed the best at this locality.

The Junipers in this collection are elegant, especially the spreading *J. equamata*. The Cryptomerias have not done very well, but a single specimen has attained the height of eighteen feet, and is very beautiful. In a sheltered spot the *Cunninghamia Sinensis* thrives quite satisfactorily, and is now about eleven feet high. The curious weeping form of *Biota Orientalis* is unusually fine, eleven feet in height.

The Yews (*Taxus*) are also well represented by good plants of the numerous varieties of *T. baccata*, especially the richly colored Golden Yew. *Cupressus Nutkaensis*, frequently miscalled *Thuiopsis borealis*, is ten feet in height and thirty-two in circumference, and perfectly hardy. An excellent companion to the above is the *C. Lawsoniana*, thirteen feet high and very beautiful. *Sequoia gigantea* has failed at this place, as at all other localities in the States. *Cedrus Deodara* has also proven uncertain.

There are good specimens in these grounds of the various

species and varieties of *Thuja*, *Cephalotaxus*, *Torreya*, etc., which reflect great credit on the indefatigable owner. The new and rare *Thuiopsis dolabrata* and its handsome variegated-leaved variety have succeeded very satisfactorily; as has the scarce Umbrella-Pine (*Sciadopitys verticillata*.)

CHAPTER XIV.

CEMETERIES AND PARKS.

There is no reason why our cemeteries and public parks should not more nearly approximate to the true meaning of the term Arboretum, and instead of a large number of Norway Spruce, American Arbor Vitæ, and Balsam Fir, all very well to a certain extent, we might have more variety. It certainly does not add to the beauty of any lawn to have any one species so greatly predominant as to give the visitor an unpleasant idea of sameness. On the contrary, by a careful selection, containing but one or perhaps two specimens each, of a distinct kind, judiciously disposed throughout the grounds, a much finer effect is produced, and a double purpose answered,—simply that of testing the nature and hardiness of a larger number, and thereby affording the novice what he most needs for his own lawn or door-yard.

In every section of our country the managers of these so-called Rural Cemeteries appear to have but one object in view, viz.: Economy. To carry this out to the letter is their highest aim, but of the true meaning of which they

seem to entertain very questionable ideas. Where the purchasing of trees at a low figure, without any appropriateness or beauty in them, approaches economy, is beyond our conception.

Economy can just as readily be kept in view by the purchaser when procuring a well-selected assortment of trees and plants from a responsible establishment, as the "penny wise, pound foolish," policy of one who purchases his trees at auction for a mere pittance. In the first instance the owner expects all his trees to grow, and by care in planting is very rarely disappointed. The latter expects the same result, is disappointed, and he usually is obliged, sooner or later, to adopt the course pursued by his wiser friend. Trees whose first cost is the lowest do not always prove the cheapest in the end, unless every other consideration be equal. Let all who live in the country plant good trees around their dwellings, and then take care of them; as much depends upon the after-management, in many cases, as upon the original condition of the tree itself.

A few words of advice in regard to selecting suitable evergreens for permanent value. After having enumerated and described so long a list as the foregoing pages present, the uninitiated reader will no doubt turn away in discouragement, as there exists such a diversity of opinion in regard to the adaptability of a large portion of the really beautiful species, which cannot be regarded as entirely unobjectionable. We desire to impress upon every owner of a rural spot who is about commencing to plant for the first time, the importance of selecting only such as have been well tested and are satisfactory beyond a doubt. Then, as a knowledge of the family shall be gained, the newer and promising species may be sparingly introduced. No greater error can be committed than for a novice to select a list of trees such as *Cedrus Deodara*, *Cryptomeria Japonica*, *Abies Morinda*, *Cunninghamia*

Sinensis, etc., and then with an utter disregard of proper situations and soil set them out in a slovenly and hasty manner, in the full expectation of having them thrive like an *Ailanthus*.

To this class of planters we say, your first duty is to select such reliable kinds as the Norway Spruce, Hemlock Spruce, American Arbor Vitæ, Austrian Pine, White Pine, Scotch Pine, etc., adding, as inclination tends, a few other really hardy and desirable well-known species.

But, at all events, let every one residing out of our cities plant a few trees at least, the number depending upon the space desired to ornament—not crowded together, nor in straight lines, but naturally and judiciously, allowing glimpses of distant views, and yet a portion sufficiently near the residence to afford a refreshing shade. Clustered in the nooks and corners, let the various flowering shrubs perfect their bloom in masses, so arranged that in the varied tints an added charm may each succeeding day be seen and felt. Along the borders of the walks, place neatly executed beds of flowers, few and plain, yet filled with choicest plants. By such means we make home dearer to ourselves, and weave attractions around the spot, that yield a fund of pleasure unsurpassed. And as the years roll on, each plant and tree therein becomes to us as a trusty friend, endeared by sweet associations of the past and bound by recollections of the care bestowed upon its younger growth.

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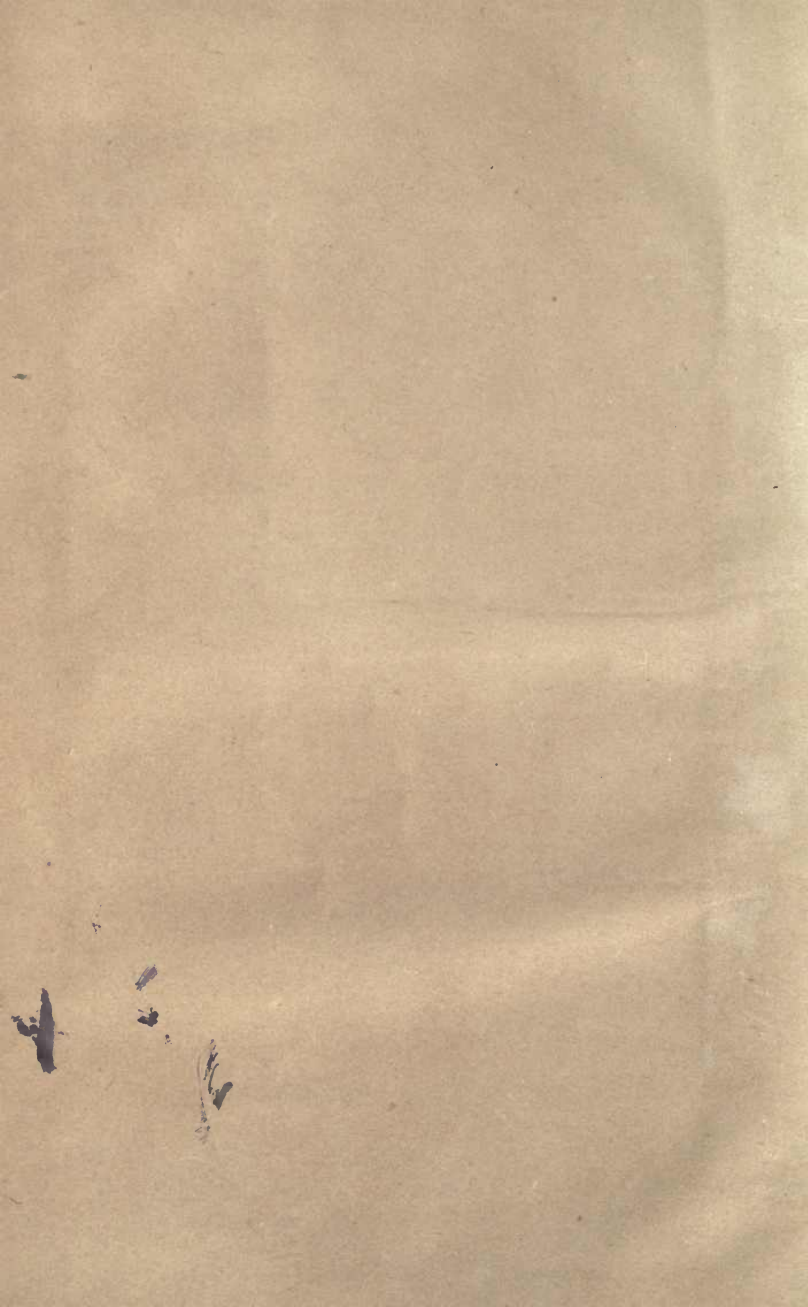
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